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Box II

CATALOGUE



OF

THE NAVAL MODELS

IN THE

SOUTH KENSINGTON MUSEUM.

PART I.—ADMIRALTY COLLECTION OF MODELS,
&c.

PART II.—COLLECTION OF MODELS FROM PRIVATE
SOURCES.



LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1865.

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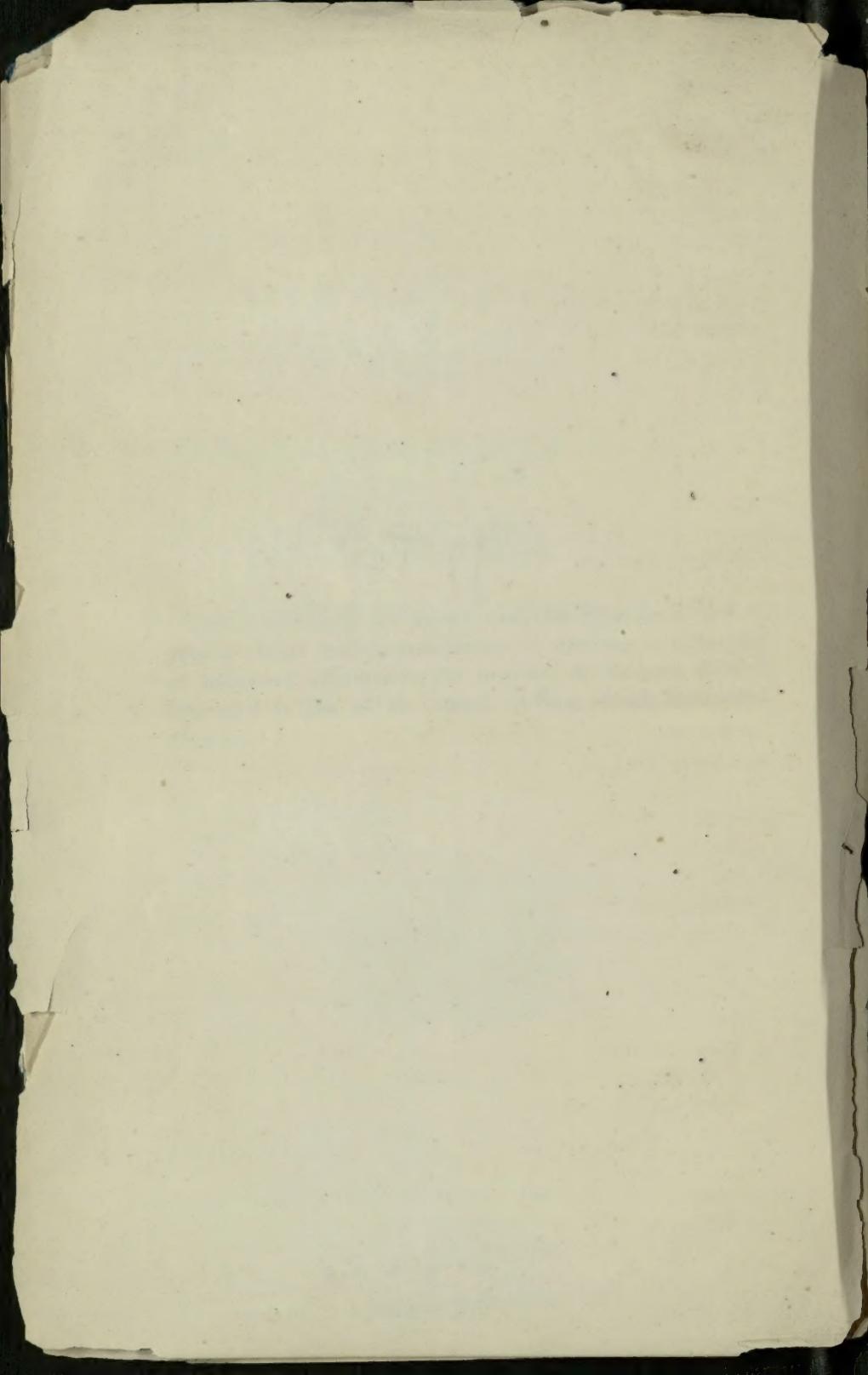
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The Secretary of the Science and Art Department will be glad to receive any communications in reference to corrections or additional information, for insertion in the next Edition, addressed to him at the Naval Gallery, South Kensington Museum.

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Box II

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APPENDIX
CLASS I.—DIVISION A.

Whole Models, representing the Lines and Forms of Ships of the Royal Navy, from its Commencement to the present Time, arranged according to their Dates and Classes.

NO. 119.

~~Model to scale of 1 in. to 30 ft. Length overall 100 ft. Breadth 36 ft. Draught of water 13 ft. 5½ in. forward, 16 ft. 5 in. aft. Tonnage 1,081. Speed 12·396. Laid down at Pembroke Yard in July 1864, launched in May 1865, sunk in the Channel by collision with another ship 10th July 1866.~~

119. The "AMAZON," 4 guns, 300 horse-power (on a $\frac{1}{4}$ -inch scale), length 187 ft., breadth 36 ft., draught of water 13 ft. 5½ in. forward, 16 ft. 5 in. aft, tonnage 1,081, speed 12·396. Laid down at Pembroke Yard in July 1864, launched in May 1865, sunk in the Channel by collision with another ship 10th July 1866.

Designed by the Controller's Department.

There were also built on the same lines the "VESTAL" at Pembroke in 1865, the "NIOBE" at Deptford in 1866, the "NYMPHE" at Deptford in 1866, the "DRYAD" at Devonport in 1866, and the "DAPHNE" at Pembroke in 1866.

The armament was as follows, viz.:

No.	Prs.	Weight
2 rifled	—	6
2 smooth	64	
Total	4	

The complement of men was 130.

A whole model of this ship, on a $\frac{1}{4}$ -inch scale, will be found in the Catalogue at Class I., Division A., No. 118, page 49; also a half model in the Appendix, at Class I., Division B., No. 345, page 22.

The "BLANCHE" class were built on similar lines to the "AMAZON," but lengthened 25 ft. amidships, and the bow slightly altered. See Appendix, Class I., Division B., No. 346, page 23.

120. The "STAUNCH," twin-screw end-on gun boat for harbour defence, built of wood, to carry one 300-pr. 12-ton gun, 25 horse-power (on a $\frac{1}{4}$ -inch scale).

	ft. ins.
Length	75 0
Breadth	25 0
Draught of water, forward	5 10
" aft	6 6

Combined nominal power of two pair of twin-screw engines, 25 horse-power; tonnage, 200, speed 7·654 knots. No armour, but built with the idea that being so small, and fighting bow on, she would be difficult to hit. Laid down in June 1867, launched in December 1867. Built by Messrs. C. Mitchell & Co., Newcastle-on-Tyne.

Designed by Mr. George W. Rendel, of the Elswick Ironworks, Newcastle.

A half block model of this ship will be found at Class I., Division B., No. 365*, page 29, in the Appendix.

WHOLE MODELS.—SHOT-PROOF SHIPS, AFLOAT OR BUILDING.

157. The "VIPER," built of iron, twin screw, 2 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 160 ft., breadth 32 ft., draught of water 10 ft. $5\frac{1}{2}$ in. forward, 11 ft. $5\frac{1}{2}$ in. aft, tonnage 737, displacement 1,072 tons, speed 8·9 knots, area of midship section immersed 309 square feet. Built by contract in the River Thames by Messrs. J. & W. Dudgeon. Laid down in June 1864, launched in December 1865.

Designed by Controller's Department.

There was also built on the same lines the "VIXEN," in the River Thames, by Mr. C. Lungley in 1865.

The armament was two 6-ton rifled guns.

The complement of men was 80.

A half-block model of this ship will be found in the Appendix, at Class I., Division B., No. 405, page 36.

SHOT-PROOF SHIPS.—DESIGNS PROPOSED BUT NOT ADOPTED.

179. Design for an armour-plated twin-screw ship.

Proposed by Mr. W. V. Miller, Paymaster, Royal Navy, in 1865.

180. Design for an armour-plated ship-of-war with five batteries, to fire all her guns almost end on.

Proposed by Mr. G. A. Braxton in 1865.

181. Design for a ship-of-war, the peculiar form of the sides of which it was intended should render it shot proof.

Proposed by Mr. William Durand. 1865.

182. MODEL of a plan for the construction of iron-cased floating batteries in a “star-like” form, with four or more arms, and of a breadth exceeding that of the waves to which she is to be exposed, whereby it was supposed that extraordinary buoyancy would be obtained, and also that the vessel would roll less.

Proposed by Mr. J. Moody. 1866.

183. MODEL (on a scale of $3\frac{1}{2}$ inches to 20 feet) of a design for a steam ram, length 280 ft., breadth 40 ft. To be armed with two 350-pounder Mackay guns. The vessel is also designed to be propelled by a new form of paddle-wheel, with floats of the shape shown in the model.

Proposed by Major J. Scott Phillips. 1865.

184. MODEL of a design for a steam ram and propeller similar to that described in the preceding Model (No. 183).

Proposed by Major J. Scott Phillips. 1867.

185*. Design for a sea-going iron-cased twin screw turret ship, 4 guns, 800 horse-power (on a $\frac{1}{4}$ -in. scale), length 300 ft., breadth 50 ft., draught of water 23 ft., tonnage 3,590, displacement 6,012 tons, speed 13·5 knots (estimated).

The armament to be four 600-pounder guns, in two turrets.

The complement of men to be 450.

Proposed by Messrs. Samuda Brothers. 1867.

This model, and the three others at Nos. 376, 377, and 378, Class I., Division B., pages 47 and 48 of the Appendix, represent four designs for iron-cased ships, which were prepared in compliance with a letter from the Admiralty in May 1867 to certain shipbuilding firms inviting them to send in competitive plans for an iron-cased ship of from 3,500 to 3,800 tons, to be either on the turret or broadside principle, at the option of the Designer.

For further particulars in regard to these designs, see Parliamentary Paper dated 3d December 1867, No. 26.

186*. Rough MODEL of the Atkin ram.

The proposal was as follows:

The vessel to be employed wholly as a ram, carrying no guns; to be moved wholly by steam-power, having neither masts, sails, nor rigging; the athwartship sections of the bottom and sides to be circular; the deck to be arched over as shown in the model. A ram, as shown in model, to be formed at each end to avoid the necessity of turning. To have four screw-propellers driven by separate engines; the rudders to be placed entirely below water. Length 104 ft., tonnage 300.

Proposed by Mr. Robert Atkin, 1867.

187*. Plan of shot-proof ship, with certain peculiarities of construction.

Proposed by Mr. George Kirkley.

The model will be found in the Appendix, at Class IV., Division O., No. 282, page 55.

188*. MODEL of a gun boat on "Hyde's deflecting principle."

The proposal is to construct war ships with deflecting sides below the water as well as above, and thus make them secure from shot; the acuteness of the angle at which the side of the ship is to be constructed is intended to cause the shot to pass off without penetration. The teak backing is dispensed with as an internal support, and is placed vertically on the outside of the plates and secured thereto. This external application of vertical plank is intended to receive the first impact of the shot and alter its line of flight before contact with the armour plate is effected, and thus decrease the angle of deflection. Mr. Hyde considers this plan of applying the teak will admit of quick repair when gouged by shot.

By this system the armour plating being distributed over a large surface, Mr. Hyde thinks it will cause less strain to a ship than when placed on a vertical side.

As regards the action of the sea on the sponsoned side of a deflecting ship, the centres he thinks may be so arranged as to ease any defect from this source, should it exist. The angular sides being so low in the water are expected to balance each other, or the sponsoned sides may be filled in with timber in vertical blocks so as to be easily repaired when injured in action.

The dimensions of the proposed ship would be as follows:

Extreme length	200 ft.
Length at water-line	180 "
Extreme breadth	54 "
Breadth at water-line	43.1 "
Displacement at 10 ft.	1,840 tons.

Proposed by Mr. J. M. Hyde, Greenwich. 1866.

(See also Class IV., Division Q, No. 421, Appendix, page 60.)

189*. Design for a ship to be rendered shot proof by having the sides at the water-line project some 6 ft. or 8 ft., this extra breadth to be divided into compartments and filled with tow, cork, or some such material.

Proposed by Mr. Edward James Julian, 1867.

WHOLE MODELS.—MISCELLANEOUS.

199. A set of MODELS (*a.*, *b.* and *c.*) intended to illustrate a system of constructing ships; (*a.*) is a set of sections showing how one figure may be derived from another by elongation, the second form having the same sections as the first, but the distance between the sections being increased; (*b.*) is a conical figure which may be supposed to be derived from a shorter cone of the same base; (*c.*) is the form which the inventor recommends for ships' bottoms; it is a prolate spheroid, and it may be considered as derived by elongation from the sphere, which, according to the inventor, is a perfect figure.

Proposed by Mr. Thos. Pounds, R.N., 1865.

CLASS I.—DIVISION B.

Half-Models of Ships, arranged according to their Dates and Classes.

LINE-OF-BATTLE SHIPS OF TWO DECKS.

238. The "COLOSSUS," 80 guns, 400 horse-power (on a $\frac{1}{4}$ inch scale), length 190 ft., breadth 57 ft., draught of water 23 ft. 2 in. forward, 25 ft. 7 in. aft, tonnage 2,590, speed 9.312 knots. Laid down at Pembroke Dockyard, October 1843, as a

sailing ship, and launched as such June 1848. Converted for the screw-propeller at Portsmouth Dockyard in 1854 without any alteration in her form, as were also the following ships, which were built on the same lines, viz., the "MAJESTIC," at Chatham, in 1853; the "BRUNSWICK," at Pembroke, in 1855; the "CENTURION," at Devonport, in 1856; the "MARS," at Chatham, in 1856; the "GOLIATH," at Chatham, in 1858; the "MEEANEE," at Sheerness, in 1858, the "IRRESISTIBLE," at Chatham, in 1859; the "LION," at Devonport, in 1859; the "COLLINGWOOD," at Sheerness, in 1861. The "COLOSSUS" was sold in 1867.

Designed as a sailing ship by Sir William Symonds, and adapted for the screw by the Surveyor's Department.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Lower deck	{ 10 18	8-in. 32-prs.	65 56
Main	{ 4 24	8-in. 32-prs.	65 50
Upper , "	24	32 ,	42
		80	

The complement of men was 750.

239. The "NEPTUNE," 90 guns, 500 horse-power (on a $\frac{1}{4}$ inch scale), length 216 ft. 6 in., breadth 55 ft. 5 in., draught of water 23 ft. 6 in. forward, 26 ft. 5 in. aft, tonnage 2,830, speed 10·897 knots. Laid down at Portsmouth Dockyard in January 1827, as a sailing ship; launched as such in September 1832; converted for the screw-propeller in 1859.

Designed by Sir William Rule as a sailing ship, and adapted for the screw by the Surveyor's Department.

There were also built on the same lines, and converted for the screw in a similar manner, the "ST. GEORGE," at Devonport in 1859; the "TRAFalgar," at Chatham in 1859; the "CONQUEROR," at Sheerness in 1859; and the "ROYAL WILLIAM," at Devonport in 1860.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Lower deck	32	8-in.	65 9 0
Main	34	32-prs.	56 9 6
Upper	22 " 2	32 " 68 "	42 8 0 95 10 0
		90	

The complement of men was 860.

240. The "RODNEY," 90 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 214 ft. 4 in., breadth 54 ft., draught of water 18 ft. 9 in. forward, 21 ft. 6 in. aft, tonnage 2,770, speed 11·479 knots (ship light). Laid down at Pembroke Yard in July 1827, as a sailing ship; launched as such in June 1833 ; converted for the screw-propeller in 1859.

Designed by Sir Robert Seppings as a sailing ship, and adapted for the screw-propeller by the Surveyor's Department.

There were also built on the same lines, as sailing ships, the "LONDON" and the "NILE;" the former was altered to a steam ship at Devonport in 1858, in the same manner as the "RODNEY;" but the "NILE" was converted at Devonport in 1854, without being lengthened.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Lower deck	32	8-in.	65 9 0
Main	34	32-prs.	56 9 6
Upper	22 " 2	32 " 68 "	42 8 0 95 10 0
		90	

The complement of men was 840.

241. The "QUEEN," 86 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 216 ft. $7\frac{1}{2}$ in., breadth 60 ft. $0\frac{3}{4}$ in., tonnage 3,249, draught of water 22 ft. forward, 23 ft. 7 in. aft, speed 10·578 knots. Launched in 1839 as a sailing ship. Commenced cutting down and conversion to a screw ship at Sheerness Yard in August 1858, and launched as such in April 1859.

The alteration of her lines for a steam ship was by the Surveyor's Department.

There was also built as a sailing ship, on the same lines, the "FREDERICK WILLIAM," which was converted for the screw propeller in the same manner at Portsmouth in 1860.

The armament was as follows, viz.:

	No.	Prs.	Weight.	Length.
			cwt.	ft. in.
Lower deck	30	-	8-in.	65 - 9 0
Main	32	-	32-prs.	56 - 9 6
Upper "	{ 22 2	-	32 " 68 "	42 - 8 0 95 - 10 0
		36		

The complement of men was 845.

The above model and dimensions represent the ship as converted for the screw, but a model of her as a sailing ship, and her dimensions as such, will be found in the Catalogue at Class I., Division A., No. 23, page 33, and at Division B., No. 205, page 57.

242. The "ALBION," 90 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 204 ft. 4 in., breadth 60 ft. 3 in., draught of water 18 ft. 9 in. forward, 21 ft. 6 in. aft., tonnage 3,111, speed 10.986 knots (ship light). Laid down at Devonport Yard 13th August 1839, as a sailing vessel, and launched as such 6th September 1842. She was converted for the screw propeller at Devonport in 1861, without any alteration in her form, as were also the following ships, which were built on the same lines, viz., the "EXMOUTH," at Devonport in 1854, and the "ABOUKIR" at Devonport in 1858.

Designed for a sailing ship by Sir William Symonds, and adapted for the screw propeller by the Controller's Department.

The armament was as follows, viz.:

	No.	Prs.	Weight.	Length.
			cwt.	ft. in.
Lower deck	32	-	8-in.	65 - 9 0
Main	32	-	32-prs.	56 - 9 6
Upper "	26	-	32 "	42 - 8 0
		90		

The complement of men was 820.

243. The "SANS PAREIL," 80 guns, 350 horse-power (on a $\frac{1}{4}$ inch scale), length 200 ft., breadth 52 ft. 3 in., depth 22 ft. 8 in., tonnage 2,339. Laid down at Devonport Yard in September 1845 as a sailing ship. Conversion to a screw ship commenced in January 1849; launched as such in March 1851. Sold in 1867.

Designed by Sir Wm. Symonds as a sailing ship, and adapted for the screw, by the Surveyor's Department.

The armament was as follows:

	No.	Prs.	Weight.	Length.
			cwt.	ft. in.
Lower deck -	30	-	32	- 9 6
Main ",	30	-	8-in.	- 8 0
Upper ",	18	-	32-prs.	- 6 0
"	2	-	32 "	- 9 6
		80		

The complement of men was 700.

The model and the above dimensions represent the ship as she was actually built, but a model of her as a sailing ship will be found in the Catalogue at Class I., Division B., No. 223, page 62, and another model of her as a steam ship at No. 229, page 64.

HALF-BLOCK MODELS—FRIGATES

295. The "SHANNON," 51 guns, 600 horse-power (on a $\frac{1}{4}$ inch scale), length 235 ft. 1 in., breadth 50 ft. $1\frac{1}{2}$ in., draught of water 20 ft. 3 in. forward, 21 ft. 9 in. aft, tonnage 2,667, speed 11.492 knots (ship light). Laid down at Portsmouth Dockyard in January 1854; launched in November 1855.

Designed by Surveyor's Department.

There were also built on the same lines the "LIFFEY" at Devonport in 1856, the "TOPAZE" at Devonport in 1858, the "BACCHANTE" at Portsmouth in 1859, and the "LIVERPOOL" at Devonport in 1860.

The armament was as follows, viz.:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Main deck	30	8-in.	65 - 9 0
	{ 20	32-prs.	56 - 9 6
Upper „	{ 1	68 pivot	95 - 10 0
			51

The complement of men was 560.

296. The "PHÆTON," 51 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 220 ft. 3 $\frac{3}{8}$ in., breadth 49 ft. 10 in., draught of water 10 ft. 9 in. forward, 21 ft. aft, tonnage 2,396, speed 10.466 knots (ship light); launched in 1848 as a sailing ship. Commenced conversion to a screw ship at Sheerness Yard on 15th April 1859, and undocked as such on 12th December 1859.

The alteration of her lines to a steam ship was by the Surveyor's Department.

The armament was as follows, viz.:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Main deck	8	8-in.	65 - 9 0
	{ 22	32-prs.	56 - 9 6
	{ 2	8-in.	65 - 9 0
Upper „	{ 18	32-prs.	45 - 8 6
	{ 1	68 pivot	95 - 10 0
			51

The complement of men was 540.

The model and the above dimensions represent the ship as converted for the screw, but a model of her as a sailing ship, and her dimensions as such, will be found at Class I., Division B., No 275, page 76 in the Catalogue.

297. The "PHÆBE," 51 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 240 ft. 6 in., breadth 51 ft. 9 $\frac{1}{2}$ in., draught of water 16 ft. 7 in. forward, 19 ft. 4 in. aft, tonnage 2,896, speed 11.925 knots (ship light). Laid down at Devonport Dockyard in August 1848 as a sailing ship, and launched as such in September 1854. Converted for the screw propeller in 1859.

Designed by Mr. Edye as a sailing ship, and altered for the screw propeller by the Surveyor's Department.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Main deck -	8	8-in.	65
	22	32-pr.	56
Upper , ,	2	8-in.	65
	18	32-pr.	45
	1	68 pivot	95
51			

The complement of men was 525.

The "INDEFATIGABLE" was built as a sailing ship on the same lines as the "PHOEBE" before her conversion, and a model of her will be found at Class I., Division B., No. 277, page 77 in the Catalogue.

298. The "NARCISSUS," 51 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 228 ft., breadth 51 ft. 3 in., draught of water 20 ft. 3 in. forward, 23 ft. 9 in. aft, tonnage 2,665, speed 10·597 knots. Laid down at Devonport Yard in April 1857; launched in October 1859.

Designed by Surveyor's Department.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Main deck -	8	8-in.	65
	22	32-pr.	56
Upper , ,	2	8-in.	65
	18	32-pr.	45
	1	68 pivot	95
51			

The complement of men was 540.

299. The "OCTAVIA," 51 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 252 ft. 5 in., breadth 52 ft. 10 in., draught of water 20 ft. 10 in. forward, 23 ft. 10 in. aft, tonnage 3,161, speed 11·538 knots. Laid down at Pembroke Dockyard in September 1846 as a sailing ship, launched as such in August 1849. Converted for the screw propeller at Portsmouth Dockyard in 1860.

Designed by Sir William Symonds as a sailing ship, and altered for the screw propeller by the Surveyor's Department.

There were also built on the same lines as sailing vessels, and converted to steam ships in a similar manner, the "ARETHUSA" at Chatham in 1861, and the "CONSTANCE" at Devonport in 1862.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
Main deck	8	8-in.	65 9 0
	22	32-pr.	56 9 6
Upper " "	2	8-in.	65 9 0
	18	32-pr.	45 8 6
	1	68 " pivot	95 10 0
<hr/>			
51			

The complement of men was 525.

Models of the ships of this class launched as sailing ships will be found at Class I., Division B., Nos. 273 and 278, pages 75 and 77 in the Catalogue.

300*. The "INCONSTANT," 16 guns, 1,000 horse-power (on a $\frac{1}{4}$ -inch scale), length 333 ft., breadth 50 ft. 1 in., draught of water forward 22 ft., aft 24 ft., tonnage 4,066, speed 15 knots (estimated). Laid down at Pembroke Dock-yard in November 1866; launched in November 1868.

Designed by the Controller's Department.

Her armament is intended to be :

No.	Calibre.	Weight.
Main deck	10 9 in. rifled M. L.	12 $\frac{1}{2}$ tons.
Upper "	6 7 "	6 $\frac{1}{2}$ "
	<hr/>	
	16	

Her complement will be 600 men.

HALF-BLOCK MODELS.—CORVETTES, SLOOPS, &c.

339. The "RIFLEMAN," 6 guns, 100 horse-power (on a $\frac{1}{4}$ -inch scale), length 150 ft., breadth 26 ft. 7 in., draught of water 11 ft. 3 in. forward, 11 ft. 10 in. aft, tonnage 486, speed 7·15 knots. Laid down at Portsmouth Dockyard in July 1845. Undocked August 1846.

Designed by Mr. Fincham.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
1	-	56 - -	87 - -
1	-	10-in. - -	85 - -
4	-	32-pr. - -	25 - -
		6	10 0
			9 4
			6 0

The complement of men was 80.

340. The "MALACCA," 17 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 192 ft., breadth 34 ft. 4 in., draught of water 15 ft. 10 in. forward, 18 ft. aft, tonnage 1,034, speed 9.519 knots. Laid down at Moulmein in May 1849; launched in April 1853.

Designed by Surveyor's Department.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
16	-	32 - -	32 - -
1	-	10 in. - -	85 - -
		17	6 6
			9 4

The complement of men was 180.

341. The "GANNET" 11 guns, 150 horse-power (on a $\frac{1}{4}$ -inch scale), length 151 ft., breadth 29 ft. $1\frac{1}{2}$ in., draught of water 13 ft. 8 in. forward, 14 ft. 3 in. aft, tonnage 579, speed 9.928 knots. Laid down at Pembroke Yard in December 1856, launched in December 1857.

Designed by Surveyor's Department.

There were also built on the same lines the "CORDELIA" at Pembroke in 1856, the "RACER," at Deptford in 1857, the "ICARUS" at Deptford in 1858, the "PANTALOON," at Devonport in 1860.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
10	-	32 - -	25 - -
1	-	32 pivot - -	58 - -
		11	6 0
			9 6

The complement of men was 120.

342. The "GREYHOUND," 17 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 172 ft. 6 in., breadth 33 ft. $2\frac{1}{2}$ in., draught of water 14 ft. forward, 15 ft. aft, tonnage 879, speed 9·177 knots. Laid down at Pembroke Dockyard in December 1856, launched in June 1859,

Designed by Surveyor's Department.

There was also built on the same lines the "MUTINE," at Deptford in 1859.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
16	32	32	6 6
1	32 pivot	58	9 6
			17

The complement of men was 165.

343. The "ROSARIO," 11 guns, 150 horse-power (on a $\frac{1}{4}$ -inch scale), length 160 ft. 1 in., breadth 30 ft. $4\frac{1}{2}$ in., draught of water 12 ft. 8 in. forward, 13 ft. 10 in. aft, tonnage 673, speed 8·913 knots. Laid down at Deptford Yard in June 1859, launched in October 1860.

Designed by Surveyor's Department.

There were also built on the same lines the "PETEREL," at Devonport in 1860, the "RAPID," at Deptford in 1860, the "ROYALIST," at Devonport in 1861, the "SHEARWATER," at Pembroke in 1861, the "COLUMBINE," at Deptford in 1862, the "AFRICA," afterwards called the "CHINA," at Devonport in 1862.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
10	32	30	6 4
1	32 pivot	58	9 6
			11

The complement of men was 130.

344. The "WOLVERENE," 21 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 225 ft., breadth 40 ft. 9 in., draught of water 17 ft. 11 in. forward, 20 ft. 4 in. aft, tonnage 1,703, speed 11·256 knots. Laid down at Woolwich Dockyard in April 1859, launched in August 1863.

Designed by the Surveyor's Department.

There were also built on the same lines the "JASON," at Devonport in 1859, the "BARROSA," at Woolwich in 1860, the "ORPHEUS," at Chatham in 1860, the "ORESTES," at Sheerness in 1860, and the "RATTLESNAKE," at Chatham in 1861.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwts.	ft. in.
16	-	8 in.	60 8 10
4	-	40-pr. Armstrong	28 8 0
1	-	110-pr. Armstrong	82 10 0
<hr/>		21	<hr/>

The complement of men was 275.

345. The "AMAZON," 4 guns 300 horse-power (on a $\frac{1}{4}$ -inch scale), length 187 ft., breadth 36 ft., draught of water 13 ft. $5\frac{1}{2}$ in. forward, 16 ft. 5 in. aft, tonnage 1,081, speed 12·396. Laid down at Pembroke Yard in July 1864, launched in May 1865, sunk in the Channel by collision with another ship 10th July 1866.

Designed by the Controller's Department.

There were also built on the same lines the "VESTAL," at Pembroke in 1865, the "NIOBE" at Deptford in 1866, the "NYMPHE" at Deptford, in 1866, the "DRYAD" at Devonport in 1866, and the "DAPHNE" at Pembroke in 1866.

The armament was as follows, viz. :

No.
2
2
— 4 —

6-ton guns, rifled.
64-pr. guns, rifled.

The complement of men was 130.

A whole model of this ship (on a $\frac{1}{4}$ -inch scale) will be found in the Catalogue at Class I., Division A., No. 118, page 49, and on an $\frac{1}{4}$ -inch scale in the Appendix at Class I., Division A., No. 119, page 8.

The "BLANCHE" class were built on similar lines to the "AMAZON," but lengthened 25 ft. amidships, and the bow slightly altered. (See Appendix Class I., Division B., No. 346, page 23.)

346. The "BLANCHE," 4 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 212 ft., breadth 36 ft., draught of water 13 ft. 6 in. forward, 16 ft. 6 in. aft, tonnage 1,268, speed 13·631 knots. Laid down at Chatham Yard in June 1865, launched August 1867.

Designed by the Controller's Department.

There were also built on the same lines, and likewise launched in 1867, the "DANAË" at Portsmouth, and the "ECLIPSE" (first called "SAPPHO") at Sheerness; and there are also the "SIRIUS," "SPARTAN," "DIDO," and "TENEDOS," now (1868) building on the same lines.

The armament was as follows:

Two $6\frac{1}{2}$ -ton guns, and two 64-prs.

The complement of men was 110.

The "BLANCHE" class are on similar lines to the "AMAZON" class, but lengthened 25 ft. amidships, and the bow slightly altered. (See Appendix, Class I., Division B., No. 345, page 22.)

The "BRITON" class is on similar lines to the "BLANCHE" class, but lengthened 8 ft. (See Appendix, Class I., Division B., No. 347, page 23.)

347. The "BRITON," 10 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 220 ft., breadth 36 ft., draught of water 13 ft. 9 in. forward, 16 ft. 9 in. aft, tonnage 1,322, speed 12·4 knots (estimated). Laid down at Sheerness Yard in 1868.

Designed by the Controller's Department.

There was also built on the same lines the "DRUID," at Deptford.

The armament is to be:

No.	Prs.	Weight.
2	7-in.	$6\frac{1}{2}$ tons.
8	64-pr.	
10		

The complement of men is to be 200.

This class is on similar lines to the "BLANCHE" class, but lengthened 8 ft. (see Appendix, Class I., Division B., No. 346, page 23.)

348. The "JUNO," 6 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 200 ft., breadth 40 ft. 4 in., draught of water 15 ft. 11 in. forward, 17 ft. 4 in. aft, tonnage 1,459, speed 10·584 knots. Laid down at Deptford Yard in June 1866, and launched in November 1867.

Designed by the Controller's Department.

There is also building on the same lines the "THALIA," at Woolwich.

The armament was two 6 $\frac{1}{2}$ -ton revolving guns, and four 64-prs.

The complement of men was 200.

349. The "VOLAGE," 8 guns, 600 horse-power (on a $\frac{1}{4}$ -inch scale), length 270 ft., breadth 42 ft., draught 18 ft. forward, 22 ft. aft, tonnage 2,322, speed 14·625 (estimated). Built by contract at Blackwall by the Thames Ironworks and Shipbuilding Company. Laid down in September 1867; launched in February 1869.

Designed by the Controller's Department.

There was also built on the same lines the "ACTIVE," by the Thames Ironworks and Shipbuilding Company.

The armament is intended to be :

No.	Prs.	Weight.
6	7-in.	6 $\frac{1}{2}$ tons.
2	64-pr. revolving	
8		

The complement of men will be 350.

HALF-BLOCK MODELS.—GUN VESSELS.

350. The "ARROW," 2 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 160 ft., breadth 25 ft. 4 in., draught of water 10 ft. forward, 11 ft. 8 in. aft, tonnage 477, speed 11 knots. Built by contract by Messrs. C. J. Mare and Co., at Blackwall. Laid down in April 1854; launched in June 1854. Sold in May 1862. Designed by Surveyor's Department.

There were also built on the same lines, in the same year, the "BEAGLE," "SNAKE," and "LYNX," by the same contractor; and the "WRANGLER" and "VIPER" by Messrs. Green at Blackwall.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
2 - -	68 - -	95 - -	10 0

The complement of men was 65.

351. The "WANDERER," 4 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 180 ft. 11 in., breadth 28 ft. 6 in., draught of water 9 ft. 7 in. forward, 11 ft. 5 in. aft, tonnage 675, speed 10·733 knots. Built by contract at Blackwall by Messrs. Green. Laid down in May 1855; launched in November 1855. Broken up in 1866.

Designed by the Surveyor's Department.

There were also built on the same lines, about the same time, the "ALACRITY," "ASSURANCE," "COQUETTE," and nine others.

The armament was as follows:

No.	Prs.	Weight.	Length.
—	—	cwt.	ft. in.
2	-	68 pivot	95 - - 10 0
2	-	32-pr.	25 - - 6 0
<hr/>		4	
<hr/>			

The complement of men was 80.

The "STAR" class were built on similar lines to the "WANDERER" but lengthened 5 ft. by the bow. (See Appendix., Class I., Division B., No. 355, page 26.)

352. The "FLYING FISH," 6 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 200 ft., breadth 30 ft. $4\frac{1}{2}$ in., draught 10 ft. 6 in. forward, 12 ft. 10 in. aft, tonnage 871, speed 11·832 knots. Laid down at Pembroke Yard in June 1855; launched in December 1855. Broken up in 1865.

Designed by Surveyor's Department.

There were also built on the same lines the "INTREPID" and "VICTOR," at Blackwall, by Messrs. Wigram in 1855; the "NIMROD" and "ROEBUCK," at Millwall, by Mr. Russell in 1856; and the "PIONEER," at Pembroke in 1856.

The armament was as follows:

No.	Prs.	Weight.	Length.
—	—	cwt.	ft. in.
2	-	68-pivot	95 - - 10 0
4	-	32	25 - - 6 0
<hr/>		6	
<hr/>			

The complement of men was 100.

353. The "ALGERINE," 1 gun, 80 horse-power (on a $\frac{1}{4}$ -inch scale), length 125 ft. 10 $\frac{1}{2}$ in., breadth 22 ft. 11 $\frac{1}{2}$ in., draught 8 ft. 1 in. forward, 8 ft. 2 in. aft, tonnage 299, speed 9·3 knots. Built by contract, by Mr. Pitcher, at Northfleet. Laid down in October 1856, launched in February 1857. Designed by Surveyor's Department.

There were also built on the same lines the "JASPER," at Blackwall, by Messrs. Green in 1857; the "LEVEN" and "SLANEY," by Mr. Pitcher, at Northfleet in 1857.

The armament was one 10-in. pivot gun, weighing 87 cwt., length 9 ft. 6 in.

The complement of men was 50.

354. The "RANGER," 5 guns, 80 horse-power (on a $\frac{1}{4}$ -inch scale), length 145 ft., breadth 25 ft. 4 $\frac{1}{2}$ in., draught 10 ft. 8 in. forward, 12 ft. aft, tonnage 427, speed 9·006 knots. Laid down at Deptford Yard in November 1857, launched in November 1859.

Designed by Surveyor's Department.

There were also built on the same lines, about the same time, the "CYGNET," "DART," "ESPOIR," and 16 others.

The armament was as follows:

No.	Prs.	Weight. cwt.	Length. ft. in.
1	68-pivot	95	10 0
4	24 howitzers.		
5			

The complement of men was 60.

355. The "STAR," 4 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 185 ft. 1 $\frac{1}{2}$ in., breadth 28 ft. 4 in., draught 10 ft. 6 in. forward, 12 ft. aft, tonnage 695, speed 10·084 knots. Built by contract, at Millwall, by Messrs. C. J. Mare & Co. Laid down in June 1859, launched in December 1860. Designed by Surveyor's Department.

There were also built on the same lines, about the same time, the "CORMORANT," "ECLIPSE," "LILY," and 5 others.

The armament was as follows :

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
2	68 pivot	95	10 0
2	32 "	25	6 0
			4

The complement of men was 90.

This class is on similar lines to the "WANDERER" class, but lengthened 5 ft. by the bow. (See Appendix, Class I., Division B., No. 351, page 25.)

356. The "PLOVER," twin screw, 3 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 170 ft., breadth 29 ft., draught 9 ft. 4 in. forward, 9 ft. 9 in. aft, tonnage 663, speed 11.339. Laid down at Deptford Yard in November 1865, launched in February 1867.

Designed by Controller's Department.

There were also built on the same lines the "PHILOMEL" at Deptford in 1867; the "BULLFINCH" at Sheerness in 1868; the "RINGDOVE" in 1867, and the "MAGPIE" in 1868, at Portsmouth; and the "LAPWING" in 1867, and the "SEAGULL" in 1868, at Devonport; and there are also building on the same lines the "CURLEW," "WOODLARK," "VULTURE," "SWALLOW," and "BITTERN."

The armament was as follows :

No.	Prs.	Weight.
1	100	6 $\frac{1}{2}$ tons.
2	40 Armstrong.	
		3

The complement of men was 80.

357. The "FLIRT," twin screw, 4 guns, 120 horse-power (on a $\frac{1}{4}$ -inch scale), length 155 ft., breadth 25 ft., draught 8 ft. forward, 8 ft. 8 in. aft, tonnage 464, speed 10.091 knots (ship light). Laid down at Devonport Yard in April 1867, launched December 1867.

Designed by the Controller's Department.

There were also built on the same lines, and about the same time, 7 other vessels in the Dockyards and 8 others by contract.

The armament was as follows:

1	-	6½-ton gun, revolving.
1	-	64-pr. "
2	-	20 " Armstrong "

The complement of men was 70.

HALF-BLOCK MODELS.—GUN BOATS.

361*. The "ALBACORE," 2 guns, 60 horse-power (on a $\frac{1}{4}$ -inch scale), length 108 ft. 4 in., breadth 22 ft. 1 in., draught 6 ft. 10 in. forward, 6 ft. 6 in. aft, tonnage 235, speed 6·5 knots. Built by contract at West Cowes by Messrs. J. & R. White. Laid down in October 1855, launched in April 1856.

Designed by Surveyor's Department.

There were also built on the same lines, about the same time, the "AMELIA," the "BANTERER," and 113 others.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
1	-	68	10 0
1	-	32	9 6
			2

The complement of men was 36.

362*. The "CLOWN," 2 guns, 40 horse-power (on a $\frac{1}{4}$ -inch scale), length 110 ft. $2\frac{1}{2}$ in., breadth 21 ft. 11 in., draught 5 ft. 11 in. forward, 6 ft. 5 in. aft, tonnage 238, speed 6·4 knots. Built by contract by Mr. W. C. Miller at Liverpool. Laid down in January 1856, launched in May 1856.

Designed by Surveyor's Department.

There were also built on the same lines the "DRAKE," "FENELLA," and 9 others.

The armament was as follows:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
1	-	68-pivot	10 0
1	-	32 ,	9 6
			2

The complement of men was 36.

363*. The "ANGLER," 2 guns, 20 horse-power (on a $\frac{1}{4}$ -inch scale), length 100 ft., breadth 21 ft. 10 in., draught 5 ft. 6 in. forward, 5 ft. 6 in. aft, tonnage 212, speed 6·75 knots. Laid down at Devonport Yard in December 1855, launched in March 1856. Broken up at Haslar in 1869.

Designed by Surveyor's Department.

There were also built on the same lines, the "ANT," at Devonport in 1856, the "CHEERFUL," at Deptford in 1855, and 17 others.

The armament was two 32-prs., 56 cwt., 9 ft. 6 in. long.

The complement of men was 30.

364*. The "BRITOMART," 2 guns, 60 horse-power (on a $\frac{1}{4}$ -inch scale), length 120 ft. 1 in., breadth 22 ft. 1 in., draught 7 ft. 9 in. forward, 8 ft. 5 in. aft, tonnage 270, speed 7·9 knots. Built by contract by Messrs. J. and W. Smith at Newcastle-on-Tyne. Laid down in November 1859, launched in May 1860.

Designed by Surveyor's Department.

There were also built on the same lines, about the same time, the "COCKATRICE," "DOTEREL," "HERON," and about 10 others.

The armament was as follows, viz.:

No.	Prs.	Weight.	Length.
		cwt.	ft. in.
1	68 pivot	95	10 0
1	32 "	56	9 6
2			

The complement of men was 40.

365*. The "STAUNCH," 1 gun, 25 horse-power (on a $\frac{1}{4}$ -inch scale), twin screw, end-on gunboat for harbour defence, length 75 ft., breadth 25 feet, draught 5 ft. 10 in. forward, 6 ft. 6 in. aft, tonnage 200, speed 7·654 knots. Built by contract by Messrs. Mitchell & Co., at Walker Yard, Newcastle-on-Tyne. Laid down in June 1867, launched in December 1867.

Designed by Mr. George Rendel of the Elswick Iron-works, Newcastle-on-Tyne.

The armament was one 300-pounder 12-ton gun.

A whole Model of this ship will be found at Class I., Division A., No. 120., page 9, in the Appendix.

HALF-BLOCK MODELS.—TUGS.

371*. The "TURTLE," twin-screw iron tug, 20 horse-power (on a $\frac{1}{4}$ -inch scale), length 57 ft. 7 in., breadth 11 ft. $10\frac{1}{2}$ in., draught 3 ft. 6 in. forward, 5 ft. 7 in. aft, tonnage 37, speed 9·2 knots (ship light). Built by contract by Messrs. J. and W. Dudgeon at Millwall. Launched in January 1864. Designed by Messrs. J. and W. Dudgeon.

There was also built on the same lines the "AFRICAN" in 1865.

The complement of men was 7.

372*. The "TRUSTY," paddle-wheel vessel, built of iron, 150 horse-power (on a $\frac{1}{4}$ -inch scale), length 129 ft. 11 in., breadth 23 ft. $1\frac{1}{2}$ in., draught 10 ft. 6 in. forward, 10 ft. 6 in. aft, tonnage 329, speed 11·5 knots. Built by contract by Messrs. Palmer at Jarrow. Laid down October 1865, launched in February 1866.

Designed by Messrs. Palmer, Jarrow.

The "CAMEL" was built on the same lines by Messrs. Palmer in 1866.

HALF BLOCK MODELS.—PADDLE-WHEEL DESPATCH VESSELS.

375*. The "SALAMIS," 1 gun, 250 horse-power (on a $\frac{1}{4}$ -inch scale), length 220 ft., breadth 28 ft. 2 in., draught 10 ft. 3 in. forward, 10 ft. 8 in. aft, tonnage 835, speed 13·3 knots. Laid down at Chatham Yard in August 1861, launched in May 1863.

Designed by Controller's Department.

There were also built on the same lines the "ENCHANTRESS" and "PSYCHE" at Pembroke in 1862.

The armament was one 40-pr. Armstrong, 32 cwt., length 10 ft.

The complement of men was 65.

376*. The "HELICON," 1 gun, 250 horse-power (on a $\frac{1}{4}$ -inch scale), length 220 ft., breadth 28 ft. $2\frac{1}{2}$ in., draught 9 ft. 11 in. forward, 10 ft. 3 in. aft, tonnage 837, speed 14·5 knots. Laid down at Portsmouth Yard in May 1861, launched in January 1865.

Designed by Mr. Reed and Controller's Department on the lines of the "SALAMIS" (*see* No. 375*), but altered from the midship part forward.

The armament was one 40-pr. Armstrong, 32 cwt., length 10 ft.

The complement of men was 65.

HALF BLOCK MODELS.—YACHTS.

365. The "BLACK EAGLE," paddle-wheel, 1 gun, 260 horse-power (on a $\frac{1}{4}$ -inch scale), length 168 ft., breadth 26 ft. 5 in., draught 11 ft. 4 in. forward, 11 ft. 8 in. aft, tonnage 540, speed 11·1 knots. Built by contract by Messrs. Curling & Co., Limehouse. Laid down in April 1831, launched in July 1831.

Designed by Mr. Oliver Lang, but lengthened 13 ft. at Deptford in 1843.

The MODEL and above dimensions represent the ship as she was after being lengthened.

The armament was one 18-pr., 38 cwt.

The complement of men was 40.

She was originally called the "FIREBRAND," but in February 1842 her name was changed to "BLACK EAGLE."

366. The "OSBORNE," royal yacht, paddle-wheel, 430 horse-power (on a $\frac{1}{4}$ -inch scale), length 200 ft. 1 in., breadth 33 ft., draught 14 ft. 10 in. forward, 13 ft. 8 in. aft, tonnage 1,034, speed 10·7 knots. Laid down at Pembroke Yard in 1842, launched in 1843. Broken up at Portsmouth in 1868.

Designed by Sir William Symonds.

Prior to 22d December 1854 this vessel was called the "VICTORIA AND ALBERT."

Whole models of this ship will be found at Class I., Division A., Nos. 132 and 133, page 50, in the Catalogue.

367. The "FAIRY," royal yacht, screw, 128 horse-power (on a $\frac{1}{4}$ -inch scale), length 144 ft. 8 in., breadth 21 ft. 1 $\frac{1}{2}$ in., draught 4 ft. 11 $\frac{1}{2}$ in. forward, 7 ft. 0 $\frac{1}{2}$ in. aft, tonnage 312, speed 13·229 knots. Built at Blackwall Yard by contract by Messrs. Ditchborne and Mare. Launched in 1845. Broken up at Portsmouth in 1868.

Designed by Messrs. Ditchborne and Mare.

A whole model of this ship will be found at Class I., Division A., No. 134, page 50, in the Catalogue.

368. The "ELFIN," paddle-wheel, 40 horse-power (on a $\frac{1}{4}$ -inch scale), length 103 ft. 6 in., breadth 14 ft., draught 5 ft. 3 in. forward, 5 ft. aft, tonnage 98, speed 11·4 knots. Laid down at Chatham Yard in August 1848, launched in February 1849.

Designed by Mr. W. O. Lang.

369. The "VICTORIA AND ALBERT," royal yacht, paddle-wheel, 600 horse-power (on a $\frac{1}{4}$ -inch scale), length 300 ft., breadth 40 ft. $3\frac{1}{4}$ in., draught 19 ft. 10 in. forward, 14 f. aft, tonnage 2,345, speed 16·8 knots (ship light). Laid down at Pembroke Yard in 1854, launched in 1855.

Designed by Surveyor's Department.

For a short time while building this vessel was called the "WINDSOR CASTLE."

Whole models of this ship will be found at Class I., Division A., Nos. 136 and 137, page 50, in the Catalogue.

370*. The "INVESTIGATOR," paddle-wheel, 34 horse-power (on a $\frac{1}{4}$ -inch scale), length 120 ft. $10\frac{5}{8}$ in., breadth 16 ft. $0\frac{1}{8}$ in., draught 4 ft. 3 in. forward, 4 ft. 6 in. aft, tonnage 149, speed 9·1 knots. Laid down at Deptford Yard in June 1861, launched in November 1861.

Designed by Controller's Department.

371.** The "ALBERTA," Royal yacht, paddle-wheel, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 160 ft., breadth 22 ft. 8 in., draught 7 ft. forward, 7 ft. aft., tonnage 391, speed 15·3 knots (ship light). Laid down at Pembroke Yard in February 1863, launched in October 1863.

Designed by Controller's Department.

A whole model of this ship will be found at Class I., Division A., No. 138, page 50, in the Catalogue.

HALF BLOCK MODELS.—TROOP SHIPS.

391*. The "SIMOOM," built of iron, 8 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 246 ft., breadth 41 ft., draught 15 ft. 3 in. forward, 19 ft. 2 in. aft, tonnage 1,980, speed 10·64 knots. Built by contract by Mr. Napier, at Glasgow. Laid down in October 1845, launched in May 1849.

Designed by Mr. Napier.

The armament was as follows :

No.	Prs.	Weight.
		cwt.
6	32	25
2	32	56
8		

The complement of men was 174.

392*. The "MEGÆRA," built of iron, 6 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 207 ft., breadth 37 ft. 10 in., tonnage 1,395, draught 14 ft. 4 in. forward, 16 ft. 6 in. aft., speed 10·861 knots. Built by contract by Messrs. Fairbairn & Co. at Millwall. Laid down August 1845, launched May 1849. Designed by Mr. Fairbairn.

The armament was six 32-prs., 25 cwt., length 6 ft.

The complement of men was 167.

393*. The "HIMALAYA," built of iron, 6 guns, 700 horse-power (on a $\frac{1}{4}$ -inch scale), length 340 ft. 5 in., breadth 46 ft. 1 $\frac{3}{4}$ in., draught 18 ft. 10 in. forward, 21 ft. 3 in. aft., speed 12·805 knots, tonnage 3,453. Built by Messrs. C. J. Mare & Co. at Blackwall in 1853, for the Peninsular and Oriental Company, from whom she was purchased in July 1854.

The armament was six 32-prs., 25 cwt., length 6 ft.

The complement of men was 213.

394*. The "RESOLUTE," 2 guns, built of iron, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 282 ft. 10 $\frac{1}{2}$ in., breadth 36 ft. 4 $\frac{3}{4}$ in., draught 17 ft. 3 in. forward, 17 ft. 6 in. aft., tonnage 1,793, speed 11·447 knots. Built by Mr. Laird at Birkenhead, purchased and launched in 1855.

Designed by Mr. Laird.

Her armament was two 18-pr. carronades.

Her name was changed to "ADVENTURE," in February 1857.

There was also built on the same lines the "ASSISTANCE," at Birkenhead in 1855. (See Catalogue, Class I., Division B., No. 390, page 97.)

395*. The "ORONTES," built of iron, 2 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 300 ft. 1 in., breadth 44 ft. 8 in., tonnage 2,823, draught 22 ft. forward, 22 ft. 6 in. aft, speed 10·88 knots. Built by contract by Messrs. Laird, Brothers, at Birkenhead. Laid down July 1861, launched November 1862. Designed by Controller's Department.

There was also built on the same lines the "TAMAR," at Millwall by Messrs. Samuda in 1862.

The armament was two 40-pr. Armstrongs, 32 cwt., length 10 ft.

396*. MODEL (on a $\frac{1}{4}$ -inch scale) of a design for the class of troop ships intended to form a direct service for the transport of troops to and fro between England and India. Length 311 ft. 6 in., breadth for tonnage 49 ft., draught 21 ft., tonnage 4,525, horse-power 800.

Proposed by Messrs. R. Napier & Sons of Glasgow in 1864, but not adopted, as the transports were built on a design prepared by the Controller's Department. (See Nos. 397* to 399.*)

397*. MODEL (on a $\frac{1}{4}$ -inch scale) of a design for the class of troop ships intended to form a direct service for the transport of troops to and fro between England and India. Length 360 ft., breadth extreme 48 ft. $1\frac{1}{4}$ in., draught 21 ft., tonnage 4,059, 750 horse-power.

Proposed by the Thames Ironworks Shipbuilding Company in 1864, but not adopted, as the transports were built on a design prepared by the Department of the Controller of the Navy. (See Nos. 396* to 399.*)

398*. MODEL (on a $\frac{1}{4}$ -inch scale) of a design for the class of troop ships intended to form a direct service for the transport of troops to and fro between England and India. Length 350 ft., breadth extreme 47 ft. $1\frac{3}{4}$ in., depth in hold 23 ft. 1 in., tonnage 3,802, horse-power 800.

Proposed by Messrs. C. J. Mare & Co. in 1864, but not adopted, as the transports were built on a design prepared by the Department of the Controller of the Navy. (See Nos. 396* to 399.*)

399*. The "EUPHRATES," built of iron, 700 horse-power (on a $\frac{1}{4}$ -inch scale), one of a class of five to form a direct service for the transport of troops to and fro between England and India. Length 360 ft., breadth 49 ft., draught 19 ft. forward, 21 ft. aft, tonnage 4,206, speed 14·718 knots. Built by contract by Messrs. Laird, Brothers. Laid down in May 1865, launched November 1866.

Designed by the Controller's Department.

There were also built on the same lines, about the same time, the "JUMNA," by Messrs. Palmer, Brothers, the "MALABAR," by Messrs. Napier & Sons, the "CROCODILE," by Messrs. Wigram, and the "SERAPIS," by the Thames Iron Shipbuilding Company. The "CROCODILE" and "SERAPIS" are to run this side of the Isthmus, and the other three on the Indian side.

HALF BLOCK MODELS.—IRON-CASED
SHIPS.—THIRD CLASS.

401. The "TRUSTY," built of wood, 14 guns, 150 horse-power (on a $\frac{1}{4}$ -inch scale), length 173 ft. $6\frac{1}{4}$ in., breadth 45 ft. $1\frac{3}{4}$ in., draught of water 8 ft. 4 in. forward, 8 ft. 8 in. aft, tonnage 1,538, displacement 1,640 tons, speed 4·5 knots, area of midship section immersed 379 square feet. Built by contract at Limehouse by Messrs. Wigram. Laid down in October 1854, launched May 1855, broken up in 1865 by Messrs. Castle & Beech.

Designed by Surveyor's Department after a French model sent to England.

There were also built about the same time, on the same lines, the "METEOR" and the "THUNDER," at Limehouse, by Messrs. C. J. Mare & Co., and the "GLATTON," at Limehouse, by Messrs. Green.

The armament was 14 68-prs., 95 cwt., length 10 ft.

The complement of men was 200.

These and the "EREBUS" class were the first iron-clad ships constructed for Her Majesty's Navy.

402. The "EREBUS," built of iron, 16 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 186 ft. $8\frac{1}{2}$ in., breadth 48 ft. 6 in., draught of water 8 ft. 10 in. forward, 8 ft. 11 in. aft, tonnage 1,954, speed 5·5 knots. Built by contract at Glasgow, by Messrs. Napier. Laid down in January 1856, launched in April 1856.

Designed by Surveyor's Department after a French model sent to England.

There were also built on the same lines, about the same time, the "TERROR," at Newcastle-on-Tyne, by Messrs. Palmer, the "ÆTNA," at Chatham, and the "THUNDERBOLT," at Millwall, by Messrs. Samuda.

The armament was 16 68-prs., 95 cwt., length 10 ft.

The complement of men was 200.

A whole model of this ship will be found at Class I., Division A, No. 150, page 51 in the Catalogue.

These and the "TRUSTY" class were the first iron-clad ships constructed for Her Majesty's Navy.

403. The "RESEARCH," built of wood, 4 guns, 200 horse-power (on a $\frac{1}{4}$ -inch scale), length 195 ft., breadth 38 ft. 6 in., draught of water 12 ft. $1\frac{1}{2}$ in. forward, 14 ft. 8 in. aft., tonnage 1,253, displacement 1,680 tons, speed 10·354 knots, area of midship section immersed 430 square feet. Laid down at Pembroke Yard in September 1861 as a 17 gun screw sloop, commenced converting to an armoured ship September 1862, launched August 1863.

Designed by Mr. E. J. Reed and the Controller's Department.

The armament was:

No.
2 6 $\frac{1}{2}$ -ton guns.
2 100-pr. Somerset 6 $\frac{1}{2}$ -ton guns.
—
4

The complement of men was 120.

404. The "ENTERPRISE," built of wood with iron upper-works, 4 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 180-ft., breadth 36 ft. $0\frac{1}{2}$ in., draught of water 11 ft. 10 in. forward, 15 ft. 8 in. aft, tonnage 993, displacement 1,300 tons, speed 9·944 knots, area of midship section immersed 386 square feet. Laid down at Deptford Yard in May 1862; launched in February 1864.

Designed by Mr. E. J. Reed and the Controller's Department.

The armament was as follows:

No.
2 6 $\frac{1}{2}$ -ton guns.
2 100-pounder Somerset 6 $\frac{1}{2}$ -ton guns.
—
4

The complement of men was 129.

A whole model of this ship will be found at Class I., Division A, No. 153, page 52 in the Catalogue.

405. The "VIPER," built of iron, twin-screw, 2 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 160 ft., breadth 32 ft., draught of water 9 ft. 11 in. forward, 11 ft. 10 in. aft, tonnage 737, displacement 1,180 tons, speed 9·58 knots, area of midship section immersed 337 square feet. Built by contract in the River Thames, by Messrs. J. and W Dudgeon. Laid down in June 1864 ; launched in December 1865.

Designed by Controller's Department.

There was also built on the same lines the "VIXEN," composite vessel, in the River Thames, by Mr. C. Lungley, in 1865.

The armament was two 6-ton rifled guns.

The complement of men was 80.

A whole model of this ship will be found at Class I., Division A, No. 157, page 9 in the Appendix.

406. The "WATERWITCH," built of iron, 2 guns, 160 horse-power (on a $\frac{1}{4}$ -inch scale), length 162 ft., breadth 32 ft., draught of water 10 ft. 10 in. forward, 11 ft. 4 in. aft, tonnage 778, displacement 1,190 tons, speed 9·255 knots, area of midship section immersed 344 square feet. Built by contract by the Thames Iron Shipbuilding Company, in the River Thames. Laid down in November 1864; launched in June 1866.

Designed by Rear-Admiral Geo. Elliot and the Controller's Department to be propelled on the hydraulic principle.

The armament was two 6-ton rifled guns.

The complement of men was 80.

HALF BLOCK MODELS.—IRON-CASED SHIPS.—SECOND CLASS.

421. The "FAVORITE," built of wood, 10 guns, 400 horse-power (on a $\frac{1}{4}$ -inch scale), length 225 ft., breadth 46 ft. $9\frac{1}{2}$ in., draught of water 9 ft. 7 in. forward, 22 ft. 7 in. aft, tonnage 2,094, displacement 3,169 tons, speed 11·825 knots, area of midship section immersed 770 square feet. Laid down at Deptford Yard in August 1860, as a 22-gun screw corvette, commenced converting to an iron-cased ship in June 1862; launched in July 1864.

Designed by Mr. E. J. Reed and the Controller's Department.

The armament was as follows, viz.:

No.		Prs.		Weight.
4	-	100	-	120 cwt.
6	-	110	Armstrongs.	
	10			

The complement of men was 200.

422. The "PALLAS," built of wood, 6 guns, 600 horse-power (on a $\frac{1}{4}$ -inch scale), length 225 ft., breadth, 50 ft., draught 18 ft. 3 in. forward, 24 ft. 1 in. aft, tonnage 2,372, displacement 3,661 tons, speed 13·058 knots, area of midship section immersed 793 square feet. Laid down at Woolwich Yard in October 1863 ; launched in March 1865.

Designed by Mr. E. J. Reed and the Controller's Department.

The armament was as follows, viz. :

No.	Prs.	Weight.
4	100	6½-ton guns.
2	110	Armstrongs.

—
6
—

The complement of men was 225.

A whole model of this ship will be found at Class I., Division A, No. 154, page 53 in the Catalogue.

423. The "PENELOPE," built of iron, 10 guns, 600 horse-power (on a $\frac{1}{4}$ -inch scale), length 260 ft., breadth 50 ft., draught 15 ft. 9 in. forward, 16 ft. 9 in. aft, tonnage 2,997, displacement 4,368 tons, speed 12·764 knots, area of midship section immersed 770 square feet. Laid down at Pembroke Yard in September 1865 ; launched in June 1867.

Designed by Controller's Department.

The armament was as follows, viz. :

No.	Prs.	Weight.
8	300	12-ton guns.
2	40	Armstrongs.

—
10
—

The complement of men was 350.

HALF BLOCK MODELS.—IRON-CASED SHIPS.—
FIRST CLASS.

431. The "WARRIOR," built of iron, 40 guns, 1,250 horse-power (on a $\frac{1}{4}$ -inch scale), length 380 feet 2 in., breadth 58 ft. 4 in., draught 25 ft. 6 in. forward, 26 ft. 5 in. aft, tonnage 6,109, displacement 8,852 tons, speed 14·356 knots, area of midship section immersed 1,219 square feet. Built by contract at Blackwall by the Thames Iron Shipbuilding Company. Laid down in May 1859; launched in December 1860.

Designed by Surveyor's Department.

There was also built on the same lines the "BLACK PRINCE," at Glasgow, by Messrs. Napier and Sons, in 1861.

The armament was as follows, viz.:

	No.	Prs.	Weight.
Main deck	34	68	95 cwt.
Upper ,,	{ 2	68 pivot	95 "
	{ 4	40 Armstrongs.	
		40	

The complement of men was 635.

432. The "ACHILLES," built of iron, 20 guns, 1,250 horse-power (on a $\frac{1}{4}$ -inch scale), length 380 ft., breadth 58 ft. $3\frac{1}{2}$ in., draught 25 ft. 11 in. forward, 26 ft. 11 in. aft, tonnage 6,121, displacement 9,487 tons, speed 14·322 knots, area of midship section immersed 1,308 square feet. Laid down at Chatham Yard in August 1861 in a dock; undocked in December 1863.

Designed by the Controller's Department on lines very similar to the "WARRIOR" and "BLACK PRINCE," built in 1860.

The armament was as follows, viz.:

Main deck	{ 8	-	-	6½-ton guns.
	{ 8	-	-	6½-ton rifled guns.
Upper ,,	4	-	-	6½-ton
		20		"

The complement of men was 705.

A whole model of this ship will be found at Class I., Division A., No. 152, page 52 in the Catalogue.

433. The "DEFENCE," built of iron, 22 guns, 600 horse-power (on a $\frac{1}{4}$ -inch scale), length 280 ft., breadth 54 ft. 2 in., draught 24 ft. 3 in. forward, 25 ft. 5 in. aft, tonnage 3,720, displacement 5,971 tons, speed 11·618 knots, area of midship section immersed 1,086 square feet. Built by contract at Jarrow by Messrs. Palmer, Brothers. Laid down in December 1859; launched in April 1861.

Designed by the Surveyor's Department.

There was also built on the same lines the "RESISTANCE," at Poplar, by Messrs. Westwood, Baillie, and Co., in 1861.

The armament was as follows:

No.	Prs.	Weight. cwt.	Length. ft. in.
Main deck	16	68	95 10 0
Upper "	2	68 pivot	95 10 0
"	4	40 Armstrongs.	
<hr/>			
22			

The complement of men was 450.

434. The "HECTOR," built of iron, 32 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 280 ft. 2 in., breadth 56 ft. 5 in., draught 24 ft. 2 in. forward, 25 ft. 8 in. aft, tonnage 4,089, displacement 6,455 tons, speed 12·36 knots, area of midship section immersed 1,183 square feet. Built by contract at Glasgow by Messrs. Napier and Sons. Laid down in March 1861; launched in September 1862.

Designed by Controller's Department.

There was also built on the same lines the "VALIANT," at Poplar, commenced by Messrs. Westwood, Baillie, and Co., and completed by the Thames Iron Shipbuilding Company, in 1863.

The armament was as follows:

No.	Prs.	Weight. cwt.
Main deck	24	68
"	6	110 Armstrong
Upper "	22	110 ,
		82
<hr/>		
32		

The complement of men was 500.

435. The "MINOTAUR," built of iron, 50 guns, 1,350 horse-power (on a $\frac{1}{4}$ -inch scale), length 400 ft., breadth 59 ft. 4 $\frac{3}{4}$ in., draught 23 ft. 1 in. forward, 24 ft. 1 in. aft, tonnage 6,621, displacement 10,185 tons, speed 14·328 knots, area of midship section immersed 1,313 square feet. Built by contract at Blackwall by the Thames Iron Shipbuilding Company. Laid down in September 1861; launched in December 1863.

Designed by the Controller's Department.

There were also built on the same lines the "AGINCOURT," at Birkenhead, by Messrs. Laird, Brothers, in 1865; the "NORTHUMBERLAND," at Millwall, commenced by Messrs. C. J. Mare and Co., and completed by the Millwall Company in 1866.

The armament was as follows:

	No.	Prs.	Weight. cwt.	Length. ft. in.
Main deck	26	-	68	95 - 10 0
	8	-	110	82 - 10 0
Upper ,,	6	-	110	82 - 10 0
	10	-	70	60 - 9 2
		50		

The complement of men was 705.

436. The "ZEALOUS," built of wood, 20 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 252 ft., breadth 58 ft. 7 in., draught 25 ft. forward, 25 ft. 9 in. aft, tonnage 3,716, displacement 6,102 tons, speed 11·7 knots, area of midship section immersed 1,185 square feet. Laid down at Pembroke Yard in October 1859; launched March 1864.

Designed by Mr. Reed and the Controller's Department.

The armament was as follows:

	No.	Prs.	Weight. cwt.
Main deck	8	-	110 - 82
	8	-	68 - 95 ,
Upper ,,	4	-	110 - 82 ,
		20	

The complement of men was 455.

This ship was originally designed and commenced as a line-of-battle ship of 91 guns, 3,716 tons, and 800 horse-power; but by Admiralty order of July 2, 1862, she was converted to an armour-plated ship of 20 guns.

437. The "ROYAL OAK," built of wood, 34 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 273 ft., breadth 58 ft. 6 in., draught 23 ft. 8 in. forward, 25 ft. 8 in. aft, tonnage 4,056, displacement 6,416 tons, speed 12·529 knots, area of midship section immersed 1,150 square feet. Laid down at Chatham Yard in May 1860; launched in September 1862. Designed by Controller's Department.

There were also built on the same lines the "CALEDONIA" at Woolwich, in 1862; the "PRINCE CONSORT" at Pembroke, in 1862; and the "OCEAN" at Devonport, in 1863.

The armament was as follows:

	No.	Prs.	Calibres	Weight.
Main deck	24	-	68 lb. each	95 cwt.
	8	-	110 Armstrongs	82. "
Upper ,,	2	-	110	82 "
		34		

The complement of men was 605.

The ships of this class were originally designed and commenced as line-of-battle ships of 91 guns, 3,716 tons, and 800 horse-power; but by Admiralty order of May 14, 1861, they were converted to armour-plated ships.

A whole model of this ship will be found at Class I., Division A, No. 151, page 51 in the Catalogue.

438. The "ROYAL ALFRED," built of wood, 18 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 273 ft., breadth 58 ft. 7 in., draught 19 ft. 8 in. forward, 22 ft. 9 in. aft, tonnage 4,068, displacement 6,720 tons, speed 12·359 knots, area of midship section immersed 1,191 square feet. Laid down at Portsmouth Yard in December 1859; launched in October 1864. Designed by Controller's Department.

The armament was as follows, viz.:

	No.	Prs.	Weight.
Main deck	10	9-in.	12½-ton guns.
	4	7 "	6½ "
Upper ,,	4	7 "	6½ "

18

The complement of men was 600.

This ship was originally designed and commenced as a line-of-battle ship of 91 guns, 3,716 tons, 800 horse-power; but by Admiralty order of June 5, 1861, she was converted to an iron-cased ship.

439. The "LORD CLYDE," built of wood, 24 guns, 1,000 horse-power (on a $\frac{1}{4}$ -inch scale), length 280 ft., breadth 58 ft. 11 in., draught 22 ft. 3 in. forward, 24 ft. 9 in. aft, tonnage 4,067, displacement 7602 tons, speed 13·433 knots, area of midship section immersed 1,256 square feet. Laid down at Pembroke Yard in September 1863; launched in October 1864.

Designed by Mr. Reed and the Controller's Department.

The armament was as follows:

	No.	
Main deck	20	6 ton guns.
Upper ,,	4	110 Armstrongs.
	<hr/> 24	

The complement of men was 605.

440. The "REPULSE," built of wood, 12 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 252 feet, breadth 59 ft., draught 25 ft. forward, 26 ft. 6 in. aft, tonnage 3,734, displacement 6,190 tons, speed 11 $\frac{3}{4}$ knots (estimated), area of midship section immersed 1,205 square feet. Laid down at Woolwich Yard in April 1859; launched April 1868.

Designed by the Controller's Department.

The armament was as follows:

	No.	Prs.	Weight.
Main deck	8	8 in.	9 tons.
Upper ,,	4	8 in.	9 "
	<hr/> 12		

The complement of men was 500.

This ship was originally commenced as a line-of-battle ship of 90 guns, 3,074 tons, and 800 horse-power; but by Admiralty order of October 9, 1866, she was converted to an armour-plated ship of 12 guns.

441. The "LORD WARDEN," built of wood, 24 guns, 1,000 horse-power (on a $\frac{1}{4}$ -inch scale); length 280 ft., breadth 59 ft. $0\frac{1}{2}$ in., draught 22 ft. 3 in. forward, 24 ft. 9 in. aft, tonnage 4,080, displacement 7,839 tons, speed 13·5, area of midship section immersed 1,280 square feet. Laid down

at Chatham Yard in December 1863; launched in May 1865.

Designed by Mr. Reed and the Controller's Department.

The armament was as follows:

	No.	Prs.
Main deck	20	6-ton guns.
Upper ,,	4	110-pr. Armstrongs.
	24	

The complement of men was 605.

442. The "BELLEROPHON," built of iron, 14 guns, 1,000 horse-power (on a $\frac{1}{4}$ -inch scale), length 300 ft., breadth 56 ft. 1 in., draught 21 ft. 6 in. forward, 26 ft. 5 in. aft, tonnage 4,270, displacement 7,236 tons, speed 14·171 knots, area of midship section immersed 1,188 square feet. Laid down at Chatham Yard in December 1863; launched in April 1865.

Designed by Mr. Reed and the Controller's Department.

The armament was as follows:

	No.	Prs.
Main deck	{ 10 4	300 110 Armstrongs.
	14	

The complement of men was 475.

443. The "HERCULES," built of iron, 14 guns, 1,200 horse-power (on a $\frac{1}{4}$ -inch scale), length 325 ft., breadth 59 ft., draught 22 ft. 11 in. forward, 26 ft. $5\frac{1}{2}$ in. aft, tonnage 5,226, displacement 8,676 tons, speed 14·691 knots, area of midship section immersed 1,313 square feet. Laid down at Chatham Yard in February 1866 in a dock, undocked in February 1868.

Designed by the Controller's Department.

The armament as follows:

	No.	
Main deck	{ 8 2	18-ton guns. 12 "
Upper ,,	4	6 $\frac{1}{2}$ "
	14	

The complement of men, 600.

444. The "IRON DUKE," 14 guns, 800 horse-power, twin screw (on a $\frac{1}{4}$ -inch scale), length 280 ft., breadth 54 ft., draught 21 ft. 6 in. forward, 22 ft. 6 in. aft, tonnage 3,774, displacement 5,899 tons, speed 13·5 (estimated), area of midship section immersed 1,067 square feet. Laid down at Pembroke Yard in June 1867.

Designed by the Controller's Department.

There are also building on the same lines the "INVINCIBLE," and "AUDACIOUS," (launched February 1869), at Glasgow, by Messrs. Napier & Sons, and the "VANGUARD," at Birkenhead, by Messrs. Laird, Brothers.

The armament is to be as follows:

	No.	Prs.	Weight.
Main deck	6	9 in.	$12\frac{1}{2}$ tons.
Upper ,,	{ 4 4	64-prs. 9 in.	$12\frac{1}{2}$ tons.
	14		

The complement of men is to be 450.

HALF BLOCK MODELS.—TURRET SHIPS.

451*. The "SCORPION," late "EL TOUSSON," built of iron, 4 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 224 ft. 6 in., breadth 42 ft. $4\frac{1}{2}$ in., draught 14 ft. 11 in. forward, 16 ft. 4 in. aft, tonnage 1,833, displacement 2,660 tons, speed 10·515 knots, area of midship section immersed 604 square feet. Built by Messrs. Laird at Birkenhead; launched in July 1863. Designed by Messrs. Laird.

There was also built on the same lines the "WIVERN," late "EL MONASSIR," at Birkenhead, at the same time.

Her armament was four 12-ton guns in turrets.

The complement of men was 150.

A whole Model of the "WIVERN," with *tripod* masts, fully rigged, will be found at Class I., Division A, No. 156, page 53, in the Catalogue.

452*. The "PRINCE ALBERT," built of iron, 4 guns, 500 horse-power (on a $\frac{1}{4}$ -inch scale), length 240 ft., breadth 48 ft. 1 in., draught 17 ft. 9 in. forward, 19 ft. 10 in. aft, tonnage 2,529, displacement 3,687 tons, speed 11·652 knots,

area of midship section immersed 760 square feet. Built by contract, at Blackwall, by Messrs. Samuda; laid down in April 1862; launched in May 1864.

Designed by Controller's Department.

Her armament was four 12-ton guns in turrets.

The complement of men was 200.

A whole Model of this ship will be found at Class I., Division A., No. 155, page 53, in the Catalogue.

453*. The "ROYAL SOVEREIGN," built of wood, 5 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 240 ft. 7 in., breadth 62 ft. 2 in., draught 21 ft. 2 in. forward, 24 ft. 8 in. aft, tonnage 3,765, displacement 4,965 tons, speed 11.003 knots, area of midship section immersed 970 square feet. Commenced converting to an iron-cased turret ship in April 1862 at Portsmouth Yard, undocked in March 1864.

Designed by Controller's Department.

The armament was five 12-ton guns in turrets.

The complement of men was 200.

This ship was originally designed and built as a line-of-battle ship of 131 guns, 3,765 tons, and 800 horse-power, and launched as such in April 1857. By Admiralty order of 3d April 1862 she was converted to an iron-cased turret ship.

454*. The "MONARCH," built of iron, 6 guns, 1,100 horse-power (on a $\frac{1}{4}$ -inch scale), length 330 ft., breadth 57 ft. 6 in., draught 22 ft. 6 in. forward, 26 ft. aft, tonnage 5,100, displacement 8,164 tons, speed 14 knots (estimated), area of midship section immersed 1,224 square feet. Laid down at Chatham Yard in June 1866 in a dock, undocked in May 1868.

Designed by the Controller's Department.

Her armament was four 22-ton guns in turrets, and two 100-prs. in bow chasers.

The complement of men was 525.

455*. The "CAPTAIN," built of iron, 6 guns, 900 horse-power (on a $\frac{1}{4}$ -inch scale), length 320 ft., breadth 53 ft. 3 in., draught 22 ft. 6 in. forward, 23 ft. 6 in. aft, tonnage 4,272, displacement 6,950 tons, speed 14 knots (estimated), area of midship section immersed 1,078 square feet. Building by contract, by Messrs. Laird, at Birkenhead.

Designed by Messrs. Laird and Capt. Coles, R.N., C.B.

456*. The "CERBERUS," built of iron, 4 guns, 350 horse-power (on a $\frac{1}{4}$ -inch scale), length 225 ft., breadth 45 ft., draught 15 ft. 6 in. forward, 15 ft. 6 in. aft, tonnage 2,107,

displacement 3,413 tons, speed 8 knots (estimated), area of midship section immersed 663 square feet. Built at Jarrow by the Palmer Iron Shipbuilding Company (Limited) for the Melbourne Government. Laid down September 1867, launched December 1868.

Designed by the Controller's Department.

The armament is to be four 18-ton guns mounted in turrets.
The complement of men will be 155.

HALF BLOCK MODELS.—IRON-CASED SHIPS.

DESIGNS PROPOSED BUT NOT ADOPTED.

376. Design for an iron-cased ship, 12 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 290 ft., breadth 53 ft., draught of water 22 ft. 6 in., tonnage 3,794, displacement 6,206 tons, estimated speed 15 knots.

The armament to be as follows, viz.:

Main Deck -	6	12-ton guns.
Upper Deck	{ 4 2	12 " " " 64-pounder guns.
		12

The complement of men to be 450.

Proposed by the Thames Ironworks and Shipbuilding Company. 1867.

This model and the three others in the Appendix at Nos. 377 and 378, Class I., Division B, pages 47 and 48, and No. 185* Class I., Division A, page 10, represent four designs for iron-cased ships which were prepared in compliance with a letter from the Admiralty in May 1867, to certain shipbuilding firms inviting them to send in competitive plans for an iron-cased ship of from 3,500 to 3,800 tons, to be either on the turret or broadside principle, at the option of the designer.

For further particulars in regard to these designs see Parliamentary Paper dated 3rd December 1867, No. 26.

377. Design for a combined turret and broadside twin-screw iron-cased ship, 10 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 285 ft., breadth 53 ft., draught of water 21 ft. 6 in. forward, 22 ft. 6 in. aft, tonnage 3,749, displacement 5,780 tons, estimated speed 13.5 knots.

The armament to be as follows, viz.:

Main Deck	-	6	-	12 ton guns, broadside.
Upper Deck	{	2	-	12 "
	{	2	-	12 " " in one turret.

10

The complement of men to be 450.

Proposed by the Millwall Iron Company. 1867.

This model and the three others in the Appendix, at Nos. 376 and 378, Class I., Division B., pages 47 and 48, and No. 185*, Class I., Division A, page 10, represent four designs for iron-cased ships which were prepared in compliance with a letter from the Admiralty in May 1867, to certain shipbuilding firms inviting them to send in competitive plans for an iron-cased ship of from 3,500 to 3,800 tons, to be either on the turret or broadside principle, at the option of the designer.

For further particulars in regard to these designs see Parliamentary Paper, dated 3rd December 1867, No. 26.

378. Design for a twin-screw iron-cased turret ship, 4 guns, 800 horse-power (on a $\frac{1}{4}$ -inch scale), length 250 ft., breadth 45 ft., draught of water 22 ft. 6 in., tonnage 2,402, displacement 4,872 tons, estimated speed 15 knots.

The armament to be four 600-pounder guns in a fixed turret. Proposed by Mr. J. G. Laurie. 1867.

This model and the three others in the Appendix at Nos. 376 and 377, Class I., Division B, page 47, and No. 185*, Class I., Division A, page 10, represent four designs for iron-cased ships which were prepared in compliance with a letter from the Admiralty in May 1867 to certain shipbuilding firms inviting them to send in competitive plans for an iron-cased ship of from 3,500 to 3,800 tons, to be either on the turret or broadside principle, at the option of the designer.

For further particulars in regard to these designs see Parliamentary Paper dated 3rd December 1867, No. 26.

379. MODEL (on a $\frac{1}{4}$ -inch scale) of a design for an iron-cased twin-screw turret ship for Bombay, 600 horse-power, tonnage 2,015. Proposed by the Millwall Iron Company. 1866.

The part coloured yellow is movable, and represents a light temporary structure to be placed on the ship for the voyage out only.

CLASS I.—DIVISIONS C, D, and E.

N.B.—There have been no models added to these Divisions since the Catalogue was published.

CLASS II.

Models of various Boats in use in Great Britain for Men-of-War, for saving Life, and other Purposes (also Life Rafts, Life Belts, Preservers, &c.).

Divisions.

- | | |
|--|---|
| A.—Man-of-war's boats. | E.—Plans for lowering boats, and stowing and securing them on board ship. |
| B.—Boats fitted for fighting guns, laying out anchors, &c. | F.—Miscellaneous boats and appliances. |
| C.—Boats and rafts for landing or embarking troops, &c. | |
| D.—Life boats, life rafts, buoys, preservers, &c. | |
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CLASS II.—DIVISION A.

MAN-OF-WAR'S BOATS.

12. HALF BLOCK MODEL (on a $\frac{3}{4}$ -inch scale), of the ordinary service, 28 ft. pinnace, of the improved form in use in H.M.'s Navy. 1865.

13. HALF BLOCK MODEL (on a $\frac{3}{4}$ -inch scale), of the ordinary service, 30 ft. cutter, of the improved form in use in H.M.'s Navy. 1865.

14. HALF BLOCK MODEL (on a $\frac{3}{4}$ -inch scale), of the ordinary service, 30 ft. gig, of the improved form in use in H.M.'s Navy. 1865.

15. HALF BLOCK MODEL (on a $\frac{3}{4}$ -inch scale), of the ordinary service, 42 ft. launch, of the improved form in use in H.M.'s Navy. 1865.

CLASS II.—DIVISIONS B and C.

N.B.—There have been no models added to these divisions since the Catalogue was published.

CLASS II.—DIVISION D.**LIFE BOATS, LIFE RAFTS, BUOYS, PRESERVERS,
&c.**

91. MODEL of plan for an iron life boat, with water-tight cases along the sides, water-tight spaces under the flat, water-tight cases at the extremities, and an open grating in the bottom to enable the water which may be taken in over all to run out of itself through the bottom. At the extremities are portable cases for holding provisions, &c.

Proposed by Mr. W. Horne, 1866.

92. Model of a plan for increasing the buoyancy of boats, without adding permanently to their bulk, by fitting on the outside of their bottoms air tight chambers with flexible sides like a pair of bellows. These chambers to be distended when the boat is in the water, and to be made to collapse for convenience of stowing the boat when out of the water.

Proposed by Mr. J. White of Finchley, 1866.

93. MODEL of Signor Candide Ravelly's apparatus for saving life. It consists of an elastic sack filled with air, on which the person sits supported by two iron bars. (The sack has become detached, and is not exhibited.)

Proposed by Signor Candide Ravelly, 1866.

94. MODEL (on a 1-inch scale) of the stern of a ship showing the life-buoy, with all necessary fittings for letting go, guards, &c., as generally fitted to ships in H.M.'s Navy.

1866.

CLASS II.—DIVISION E.**PLANS FOR LOWERING BOATS, AND STOWING
AND SECURING THEM ON BOARD SHIP.**

120. MODEL of a plan for lowering and disengaging boats at sea in the following manner, viz., the two falls are wound on the same roller or drum, and are thereby lowered simultaneously. The lower part of the block to which each end of the boat is hung consists of a tumbling hook or bar, the point of the hook is inserted behind a flange fitted on the end of a revolving pin; this flange confines the hook

excepting at one place, where a notch is cut out sufficient to allow the point of the hook to pass through it, and thereby to release the boat. The bringing of the pins round to the proper position for letting go is accomplished as follows:— There is a grooved wheel on the end of each pin, with a projecting stud on it, over which the end of a line is passed ; the other end of each line after passing through a leading block is wound on a wheel or drum under the midship thwart ; by lifting a lever attached to this drum the lines are taken in and the pins are made to turn round through the required angle.

The model also represents a plan for disengaging the gripes by means of a tumbling hook or bar similar to that described above, which can be released by turning a lever fitted inside the ship.

Proposed by Lieut. E. R. May, of Her Majesty's late Indian Navy. 1866.

121. MODEL of a plan for turning boats in. Proposed by Captain Henry W. Hire, R.N. 1867.

122. WORKING MODEL of Murray's Patent Lowering Apparatus for Boats. 1866.

123. SPECIMEN of Murray's Patent Lower Purchase Blocks for Lowering Boats. This and the preceding invention were proposed by Mr. Digby Murray, Ormskirk, Lancashire, 1866.

124. MODEL (on a 2-inch scale) of a section of a ship's side, with a 28 ft. cutter suspended at the davits by Kynaston's Boat Lowering Hooks : also a specimen hook full size.

This invention is generally adopted in the Royal Navy, it enables boats to be lowered quickly and safely from ships underway, and is so arranged that after the lowering has commenced the officer in charge of the boat still retains command of the hook until he considers the boat should be freed, when by letting go the small lanyard, hitherto held in his hand, both hooks are instantaneously disengaged.

1862.

125. Section (on a $\frac{1}{2}$ -inch scale) of a deck, showing the crutches as generally fitted to ships in the Royal Navy, with the boats and booms stowed, and all spare gear.

1867.

CLASS II.—DIVISION F.

MISCELLANEOUS BOATS AND APPLIANCES.

159. MODEL of an iron-clad boat to carry one man or more. It is meant to be so buoyant that when the waves strike it the water shall run out before it flows over the weir. The lid is to be water-tight, and made to shut when the man or men are inside. The sight is to open and close like a skylight window, that the man may fire over the weir. The top is to be of steel, and bullet-proof. The man is to sit on the bottom of the boat and propel it with his feet, by means of propellers on the soles of his boots, to open and close at each stroke, and likewise by means of propellers to work with the hand on each side of the boat. These are to be made something similar to those represented in the inside of the boat. Univalvular joints are to be fitted for the propellers to work in. The mark on the side of the boat is for the propellers, which all work under water. It is supposed by the inventor that ships might be built on the same model.

Proposed by Mr. Robert Ballantyne, 1866.

CLASS III.

Models of Boats and Vessels used for Fighting and other Purposes at various Periods in Foreign Countries.

46. MODEL (on a $\frac{1}{4}$ -inch scale) of a twin screw yacht, built for the Emperor of the French. Length 61'88 ft., breadth 12'73 ft., draught of water 3'44 ft. forward, 4'72 ft. aft, speed 11 knots. Built in 1862.

47. Half-Block MODEL (on a $\frac{1}{4}$ -inch scale), of a design for an iron-cased ship, to be built of iron, 500 horse power, length 270 ft., breadth 50 ft., draught of water 19 ft. 9 in. forward, 20 ft. 0 in. aft, tonnage 3,200, speed 11 knots.

Built by contract by Messrs. J. and G. Thompson, at Glasgow, for the Turkish Government, about the year 1864.

CLASS IV.

Models showing Details of the Mode of Construction adopted or proposed for particular Parts of Ships and the principal Changes which have at various Periods been made therein.

Divisions.

WOODEN SHIPS.

- A.—Keels, including blocks and wedges.
- B.—Floor timbers.
- C.—Futtocks and frames of ships.
- D.—Bow (framing).
- E.—Stern (framing, &c.)
- F.—Wales.
- G.—Beams.
- H.—Knees, shelf-piece, water-ways, &c., and mode of connecting beams to the ship's side.
- I.—Models of more general principles in the construction of wooden ships which cannot be classed under the above heads, such as diagonal riders, &c.

P.—Plans for fastening armour plates, including bolts, &c. for that purpose, also models showing the arrangement of armour plates.

Q.—Plans for rendering ships shot-proof. (See also Class I. Div. A.)

R.—Construction of composite ships.

IRON SHIPS.

- K.—Keels.
- L.—Bow, stern, and midship framing.
- M.—Skin plating and riveting.
- N.—Beams, and mode of connecting the same to the ship's side.
- O.—Models of more general principles in the construction of iron ships which cannot be classed under the above heads, such as keelsons, longitudinal stringers, water-tight bulkheads, &c.

CLASS IV.—DIVISIONS A to N.

N.B.—There have been no Models added to these Divisions since the Catalogue was published.

CLASS IV.—DIVISION O.

MODELS OF MORE GENERAL PRINCIPLES IN THE CONSTRUCTION OF IRON SHIPS WHICH CANNOT BE CLASSED UNDER THE ABOVE HEADS, SUCH AS KEELSONS, LONGITUDINAL STRINGERS, WATER - TIGHT BULKHEADS, &c.

278. MODEL of a portion of a ship's side and a bulkhead, showing a method of attaching a water-tight bulkhead to a ship's side, with double frames and doubling plates to the

outside strakes of plating, as adopted in the construction of ships for the Mercantile Marine, and approved of by Lloyd's (1865).

- A. Shows the frames ;
- B. The double frames ;
- C. The outside strakes ;
- D. The inside strakes ;
- E. The doubling plates ;
- F. The bulkhead stiffeners ;
- G. The bulkhead plates ; and
- H. The joggle, by means of which the ends of the joints of the bulkhead plates between the double frames are brought flush.

279. Half mid-ship section (on a $\frac{1}{2}$ -inch scale) of H.M.'s iron-cased frigate "BELLEROPHON," launched April 1865, showing the detailed arrangement of the framing, and mode of combining the several parts of the hull amidships; the features having the greatest claim to novelty being distinguished by letters.

- A. Flat keel plates worked in two thicknesses, continuously.
- B. Vertical keel plates, continuous.
- C. Vertical keelson, continuous.
- D. Water-tight transverse frames fitted between longitudinals.
- E. Short transverse bracket frames fitted between longitudinals.
- F. Longitudinal frames, continuous.
- G. Transverse angle irons.
- H. Transverse frames.
- I. Inner bottom plating.
- K. Box boiler bearers.
- L. Wing passage bulkhead.
- M. Transverse water-tight bulkhead.
- N. Plates to support the ends of beams under battery.
- O. Girders to support the beams under battery.
- P. Gutter for draining decks, continuous.
- Q. Bracket frames to form top sides.
- R. Bilge keels.
- S. Top side plates behind armour, worked in two thicknesses, continuously.
- T. External longitudinal girders, continuous.
- U. Wood backing, 10 in. thick, worked longitudinally.
- V. Six-inch armour plates.

280. MODEL (on a $\frac{1}{2}$ -inch scale) of the stern framing of H.M. iron-cased frigate "BELLEROPHON," launched April 1865, showing the stern post, stern tube, after-part of keels, and mode of securing the lower part of the balanced rudder.

281. Half midship section (on a $\frac{1}{2}$ -inch scale), of H.M. iron-cased frigate "HERCULES," built in 1868, showing the detailed arrangement of the framing and mode of combining the several parts of the hull amidships; the features having the greatest claim to novelty being distinguished by letters.

- A. Flat keel plates, worked in two thicknesses, continuously.
- B. Vertical keel plates, continuous.
- C. Vertical keelson, continuous.
- D. Water-tight transverse frames, fitted between longitudinals.
- E. Short transverse bracket frames, fitted between longitudinals.
- F. Longitudinal frames, continuous.
- G. Transverse angle irons.
- H. Transverse frames.
- I. Inner bottom plating.
- K. Box boiler bearers.
- L. Wood fillings, worked longitudinally between the ship's side and the side bulkhead.
- M. Side bulkhead.
- N. Transverse water-tight bulkhead.
- O. Gutters for draining decks, continuous.
- P. Bilge keels.
- Q. Top side plates behind armour, worked in two thicknesses, continuously.
- R. External longitudinal girders, continuous.
- S. Wood backing, 12 in. thick, worked longitudinally.
- T. 9-in. armour plates.
- U. 8-in. armour plates.
- W. 6-in. armour plates.

282. MODEL (on a $\frac{1}{8}$ -inch scale) of a plan for constructing an iron-clad ship, by which the inventor supposed the following advantages would be obtained:

- (a.) The lines would give a sharp floor and form a natural bilge piece, being nearly horizontal, in order to lessen the rolling properties.
- (b.) The upper works being inclined at an angle would deflect the shot, and require less heavy plating.

- (c.) A central battery could be built from the base of the angle which the sides form.
- (d.) The form of side admits of firing fore and aft in a line parallel to the keel.
- (e.) The bilge pieces are adapted to admit of twin screws, and give great strength.

Proposed by George Kirkley, shipwright, Woolwich Dockyard. 1867.

283. MODELS, two in number (*a* and *b*), descriptive of a plan for constructing iron shot-proof ships, showing the framing, skin-plating, mode of attaching armour-plates, &c.

Proposed about the year 1862, but the name of the inventor and the exact date are not known.

CLASS IV.—DIVISION P.

PLANS FOR FASTENING ARMOUR-PLATES, INCLUDING BOLTS, &c., FOR THAT PURPOSE; ALSO MODELS SHOWING THE ARRANGEMENT OF ARMOUR-PLATES.

348. Plan for rendering ships shot-proof by means of armour-plates of a peculiar form.

Proposed by Mr. S. G. Dutton, 1865.

349. Plan for the washers for the points of armour-plate bolts, made of india-rubber rings, let into iron cups. A and B are two slightly different modes of applying this plan. C. C. C. are three specimens of the india-rubber ring.

Proposed by Mr. B. Truss, 1865.

350. Two MODELS (A and B) of iron spring washers for the points of armour-plates and other bolts.

Proposed by Mr. W. Paget, and ordered to be tried in 1865.

351. MODEL (on a $\frac{1}{4}$ -inch scale) of a plan for protecting the lower part of a turret by placing a circular belt of armour-plating close against the turret instead of armour-plating the ship's side; the model also shows (by removing the part marked A), in the event of a portion of the side and deck of the ship being shot away, what support would remain for the cylindrical belt of armour-plating.

Proposed by Capt. C. P. Coles in 1866.

(The Model will be found at Class VII., Division F., No. 174, Appendix, page 78.)

352. MODEL of a plan for armour-plating ships. It proposes that armour-plates should be only about 2 ft. square, that they should be made in an arched form, and be fastened by bolts between the edges, and that either in front of them or behind them there should be a network of interwoven hoop iron about 6 in. thick.

Proposed by Mr. Lockhart Morton, Melbourne, 1867.

353. MODEL of bolt for fastening armour-plates, made so as to prevent the fracture of the bolt at the thread by giving the bolt a certain facility of elongation. This is done by cutting a narrow longitudinal slot out of the bolt, or rather by making a welded bolt with a slot-shaped vacancy as shown in the model.

Proposed by Mr. James Chalmers, 1866.

CLASS IV.—DIVISION Q.

PLANS FOR RENDERING SHIPS SHOT-PROOF.

412. Three MODELS (A, B, and B B) of a plan for rendering ships shot-proof by means of bolts with large hemispherical heads instead of armour-plates. A and B are two slightly different modes of applying the plan, B B represents the bolt.

Proposed by Mr. H. Keach, in 1865.

413. A set of MODELS, four in number (A, B, C, and D), showing a plan for constructing iron-cased ships, and for working guns in the following manner, viz. :

A shows the ship's side, which is to be inclined from the gun-deck upwards at an angle of 60° from the vertical, and also instead of the ordinary portholes a proposal to frame apertures in the side, 5 ft. wide, and to place therein solid cylinders or turrets of iron, 5 ft. in diameter and 7 ft. high, capable of turning on their centre; a hole is cut in the cylinder large enough to receive the muzzle of the gun, and to admit of the necessary elevation and depression. When firing, therefore, the exposed aperture is to be limited in the fore and aft direction to the width of the muzzle of the gun, and after the gun has been fired and run in, the cylinder can be turned round so as to completely close the port.

B represents a plan for bringing the armour-plates directly on the frames of the ship; the frames to be made of the peculiar form shown, and to be supported by diagonal bars of similar shape forming truss work. The spaces between

the frames and bars to be filled with a "rammed sand core." The armour-plates to be fastened by first bolting to the ship's side vertical plates or strips having in them a dovetail groove. A similar groove is also cut out of the corresponding part of the armour-plate, and when the plates are in place the grooves are filled up and the plates thereby secured either by driving in long wooden keys, or by pouring in molten metal.

C and D shew a further proposal to connect the plates at their edges and butts by the insertion of similar double dovetail strips.

Proposed by Mr. G. Johnson, 1866.

414. MODEL (on a $\frac{3}{4}$ -inch scale) of a target representing a portion of the side of H.M. iron-cased frigate "WARRIOR," launched in 1860, showing the means adopted for rendering the ship shot proof.

Its component parts may be described as follows, viz.:

- A. Armour plates $4\frac{1}{2}$ in. thick.
- B. Wood backing, in two thicknesses of 8 in. and 10 in., with an iron longitudinal stringer worked into it made up of a web plate 10 in. $\times \frac{9}{16}$ in., having double angle irons $3\frac{1}{2}$ in. $\times 4\frac{1}{2}$ in. $\times \frac{9}{16}$ in. riveted to it and the skin plating.
- C. Skin plating $\frac{9}{16}$ in. thick, the upper and lower strake being worked double.
- D. Vertical frames made up of web plates 10 in. $\times \frac{7}{16}$ in. with double angle irons $3\frac{1}{2}$ in. $\times 4\frac{1}{2}$ in. $\times \frac{5}{8}$ in. riveted to them and the skin plating, and reverse angle irons $3\frac{1}{2}$ in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in.

This model is so constructed that it may be taken to pieces to show the various parts. A target such as this model represents was constructed and fired at at Shoeburyness in 1861.

415. MODEL (on a $\frac{3}{4}$ -inch scale) of a target representing a portion of the side of H.M. iron-cased frigate "BELLEROPHON," launched in 1865, showing the mode of construction adopted for rendering the ship shot proof.

Its component parts may be described as follows :

- A. Armour plates 6 in. thick.
- B. Wood backing 10 in. thick, with longitudinal angle iron stringers worked into it, those behind the upper armour plates being 9 in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in., and those behind the lower plates 10 in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in., all of them riveted to the skin plating.

- C. Skin plating in two thicknesses of $\frac{3}{4}$ in.
- D. Vertical frames made up of angle irons 10 in. \times $3\frac{1}{2}$ in. $\times \frac{1}{2}$ in., with double angle irons riveted to them and the skin plating.

This model is so constructed that it may be taken to pieces to show the various parts. A target such as this model represents was constructed and fired at at Shoeburyness in 1863.

416. MODEL (on a $\frac{3}{4}$ -inch scale) of the Chalmers' target, intended to represent a portion of the side of an iron-cased ship, showing a mode of construction for rendering ships shot-proof.

Proposed by Mr. Chalmers.

The principal component parts may be described as follows:

- A. Armour plates $3\frac{3}{4}$ in. thick.
- B. Backing, composed of alternate layers of timber planking and iron ribs 10 in. thick.
- C. Intermediate armour plate $1\frac{1}{4}$ in. thick.
- D. Cushion of timber planking, 4 in. thick.
- E. Skin plating $\frac{5}{8}$ in. thick.
- F. Vertical frames made up of angle irons 10 in. \times $3\frac{1}{2}$ in. $\times \frac{1}{2}$ in., with double angle irons $3\frac{1}{2}$ in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in. riveted to them and to the skin plating.

This model is so constructed that it may be taken to pieces to show the various parts. A target such as this model represents was constructed and fired at at Shoeburyness in 1865.

417. MODEL (on a 1-inch scale) of a target representing a portion of the side of H.M. iron-cased frigate "HERCULES," built 1868, showing the mode of construction adopted for rendering the ship shot proof.

Its component parts may be described as follows :

- A. Armour plates 8 in. and 9 in. thick respectively.
- B. Wood backing, proper, 12 in. thick, with longitudinal angle iron stringers 12 in. $\times 3\frac{1}{2}$ in. $\times \frac{5}{8}$ in. worked into it and riveted to the skin plating.
- C. Skin plating proper, in two thicknesses of $\frac{3}{4}$ in.
- D. Vertical frames made up of angle irons 10 in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in., with double angle irons $3\frac{1}{2}$ in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in. riveted to them and the skin plating.
- E. Inner wood backing, 2 ft. thick at the upper part and 1 ft. 4 in. at the lower part.
- F. Inner skin plating $\frac{5}{8}$ in. thick.

G. Inner vertical frames made up of angle irons 7 in. $\times 3\frac{1}{2}$ in. $\times \frac{1}{2}$ in. with single angle irons $3\frac{1}{2}$ in. $\times 3\frac{1}{2}$ in. $\times \frac{5}{8}$ in. riveted to them and the skin plating.

This model is so constructed that it may be taken to pieces to show the various parts. A target such as this model represents was constructed and fired at at Shoeburyness in 1865.

418. Plan for rendering ships shot-proof by making the sides of the ship at the water-line project some 6 ft. or 8 ft., this extra breadth to be divided into compartments to be filled with tow, cork, or some such material.

Proposed by Mr. Edward James Julian. 1867.

(The model will be found at Class I., Division A, No. 189*, Appendix, page 12).

419. MODEL illustrative of a plan for covering ships with layers of galvanised wire network, for affording protection against the blows of shot, rocks, &c., especially to secure merchant ships against injury by grounding, but also for ships of war as a substitute for armour plates.

Proposed by Mons. Alphonse Lemaître. 1867.

420. Specimen of Mr. Bielefield's patent fibrous slab, proposed by Captain R. Scott, R.N. for coating the outsides of armour plates to increase their resistance to shot. 1865.

(The specimen will be found at Class XVII., No. 26, page 114, Appendix.)

421. MODEL (on a $1\frac{1}{2}$ -inch scale) of a target representing a portion of the side of a ship with deflecting sides below the water, as well as above, to make them secure against shot on the plan proposed by Mr. J. M. Hyde.

Mr. Hyde proposed that a target, such as this model represents, should be constructed and fired at at Shoeburyness. 1866.

(See also Class I., Division A, No. 188*, Appendix, page 11.)

422. MODEL of a plan for protecting the sides of ships against shot by the following combination:—1st, on the outside, 6 centimetres of iron; 2nd, 2 centimetres of lead; 3rd, 19 centimetres of an impermeable composition the nature of which is not stated; 4th, 8 centimetres of cork; making in all a thickness of 35 centimetres.

Proposed by Mr. Joseph Soldevilla. 1867.

CLASS IV.—DIVISION R.

CONSTRUCTION OF COMPOSITE SHIPS.

480. MODEL showing bottom planking in composite gun boats of "Dwarf" class, secured with yellow metal bolts instead of copper bolts.

Proposed by the Chatham Officers, and tried in the "BEACON," for fastening the outer thickness of planking. 1867.

481. Specimens of yellow metal screw bolts used in the composite gun boats of the "Dwarf" class after being tested at Portsmouth Dockyard. 1867.

CLASS V.

Models showing the Mode of fitting various Parts of Ships.

Divisions.

- | | |
|---|---|
| A.—Hawse holes. | H.—Ship's side and port scuttles, and mode of securing them. |
| B.—Catheads, and modes of fitting them. | I.—Ventilation of ships, air tubes, &c. |
| C.—Magazines, magazine passage lights, &c. | J.—Scuppers. |
| D.—Cabins and their fittings, such as louvre and venetian frames, bulkheads, cants, &c. | K.—After parts of ships, showing the arrangements necessary in connexion with the screw propeller, and to enable it to be raised. |
| E.—Hatchways and skylights, with coamings, also ladders, &c. | L.—Shot-proof conning houses, evolution bridges, &c. |
| F.—Port sashes, and their mode of fitting. | M.—Miscellaneous fittings which cannot be classed under any one of the preceding heads. |
| G.—Plans for fitting ports, half-ports, and for raising and securing the same. | |

CLASS V.—DIVISION A.

HAWSE HOLES.

8. Section (on a $\frac{1}{2}$ -inch scale) of the bow of H.M.S. "NIOBE," launched in 1866, showing the hawse hole, and method of fitting the plugs and bucklers, as generally adopted in H.M. service. 1866.

CLASS V.—DIVISION B.**CATHEADS AND MODES OF FITTING THEM.**

37. MODEL on a $\frac{1}{2}$ -inch scale of the bow of H.M.S. "BELLEROPHON," launched in 1865, showing the anchor, with the necessary fittings for stowing and letting go, including bolsters, chocks, and linings, bill-boards and plates, shank painter, slip stopper, crutches, fish davits and steps, and all necessary bolts and cleats, as generally fitted to ships in H.M. Navy. 1866.

The anchor itself, however, is not the common Admiralty anchor, but one on Rodger's plan.

CLASS V.—DIVISION C.**MAGAZINES, MAGAZINE PASSAGE LIGHTS, &c.**

62. Sectional MODEL (on $\frac{1}{2}$ -inch scale) of H.M.S. "NIOBE" launched in 1865, showing the magazine and all internal works, and of the light, handing, and shell rooms, with all light boxes, lamps, lanthorns, and guards thereto, also the ventilating and telegraphic arrangements, as generally fitted in ships in H.M. Navy. 1866.

CLASS V.—DIVISION D.

N.B.—There have been no models added to this division since the Catalogue was published.

CLASS V.—DIVISION E.**HATCHWAYS AND SKYLIGHTS, WITH COMBINGS, &c., ALSO LADDERS.**

119. Sectional MODEL (on a 1-inch scale), showing a skylight with sashes and dead lights, as generally fitted in ships in H.M. Navy. 1866.

120. Section (on a 1-inch scale) showing the companion and hoods over hatch and ladder ways, as generally fitted to ships in H.M. Navy. 1866.

121. Section (on a $\frac{1}{2}$ -inch scale) of a ship's side, showing the accommodation ladder, with platform, stanchions, and all necessary fittings, as generally supplied to ships in H.M. Navy. 1866.

CLASS V.—DIVISION F.

PORt SASHES, AND THEIR MODE OF FITTING.

155. MODEL (on a $\frac{1}{2}$ -inch scale) of the stern of H.M.S. "BRISTOL," launched 1861, showing the munions and stern sashes, with blinds or deadlights, as generally fitted to ships in H.M. Navy. 1866.

CLASS V.—DIVISION G.

PLANS FOR FITTING PORTS, HALF-PORTS, AND FOR RAISING AND SECURING THE SAME.

204. MODEL of a port lid and frame, fitted with an improved kind of india-rubber beading.

Proposed by Mr. R. C. Fuller, June 1865, as an improvement on his previous plans. (See Catalogue, Class V., Division G., Nos. 202 and 203, page 159.)

205. Improved hinge for winding port and scuttle lids, adapted to suit any angle.

Proposed by Mr. Stone in 1865, and generally adopted.

206. MODEL (on a $\frac{1}{2}$ -inch scale), showing the ports at the corners of the battery in the "PENELOPE," launched in 1867. B B are the proposed fashion-pieces to be worked in with the plank, for taking out the angles and improving the appearance.

207. MODEL of a part of the side of the "HERCULES," built 1868, with an 18-ton gun mounted, showing the amount of squaring of port and training of the guns which can be obtained at extreme elevation and depression.

Proposed by the Chatham officers, December 1866, and adopted with slight modification.

208. Sectional MODEL (on a $\frac{1}{2}$ -inch scale) of H.M.S. "CALEDONIA," launched 1862, showing a gun deck port, with the port lids, and means of securing the same, as generally fitted to ships in H.M. Navy. 1866.

209. MODEL showing, instead of the ordinary port-holes, a proposal to frame apertures in the side, 5 ft. wide, and to place therein solid cylinders or turrets of iron, 5 ft. in diameter, and 7 ft. high, capable of turning on their centre; a hole is cut in the cylinder large enough to receive the muzzle of the gun, and to admit of the necessary elevation and depression. When firing, therefore, the exposed aperture is to be limited in the fore and aft direction to the width of the muzzle of the gun, and after the gun has been fired and run in, the cylinder can be turned round so as to completely close the port.

Proposed by Mr. G. Johnson. 1866.

(This model will be found at Class IV., Division Q, No. 413, Appendix, page 57.)

210. Sectional MODEL (on a $\frac{1}{2}$ -inch scale) of H.M.S. "NIOBE," launched 1866, showing a gun deck port, with the port lids and all fastenings, rings, bolts, nozzles for pendants, &c., as generally fitted to ships in H.M. Navy. 1866.

CLASS V.—DIVISION H.

SHIP'S SIDE AND PORT SCUTTLES, AND MODE OF SECURING THEM.

250. Half-size MODEL of a plan of fitting port scuttles proposed by the Portsmouth officers, suitable for all descriptions of scuttles, being a modification of a plan suggested by Commander Stirling, to supersede the usual mode of fitting with a chain or a prop. A segment or bar is fitted for opening the scuttle, having a hinge, or an eye in an eye on the scuttle, to prevent the bar being lost if unshipped.

It is proposed to secure the port by keys as shown, like those used for Lang's tubes.

The bar not to be longer than is necessary for raising the scuttle to the level. 1866.

251. Half-size MODEL of a plan of fitting port scuttles; proposed by the Chatham officers, and fitted in the "REINDEER," launched in 1866.

The scuttles are kept open by a prop, which is considered more convenient than the bar, because it enables sashes to be fitted in all the ports. These can be removed for cleaning by taking out the beads, which are secured by metal screws. 1866.

Adopted for all new ships, to be fitted to every port right fore and aft, except in special cases.

252. Sectional MODEL (on a 3-inch scale) of a ship's side, showing the Lang's tube scuttle, plug, and all fittings connected therewith, as generally fitted to ships in H.M. Navy. 1866.

CLASS V.—DIVISION I.

VENTILATION OF SHIPS, AIR TUBES, &c.

289. MODEL of a fire-proof ventilator for spirit rooms, formed of metal bars, which are fitted so that one set of bars, made to form acute angle edges, will overlap another set of bars with obtuse angles alternately, with sufficient space between the bars to form winding passages for air to pass around, and not in direct currents through them. Between the frames of metal bars two partitions of wire gauze are fitted, through which flame cannot pass.

Proposed by Mr. W. Ladd, master shipwright, Deptford Yard, in 1865.

290. MODEL of a self-acting ventilator for the ventilation of ships, barrack-rooms, or workshops. The model shows the plan as adapted to a small work room under arches, without any escape for the air except through the window in the area. The ventilator is set in motion by the action of the door, working a closely-fitting fan inside, which rests on pivots near the nozzle, and acts both upward and downward. There are two valves near the nozzle, opening outwards which prevent the foul air returning.

The mode of working it can be varied to suit any circumstances by a driving band connected with a steam engine, for mines, large rooms, steam ships; or by a pendulum and weight for smaller rooms or sailing ships, or any other method for railway tunnels and store rooms.

Proposed by Mr. Thomas Moorecock, 1867.

291. Working MODEL of a self-acting ventilator, for getting rid of impure air and getting a supply of pure air without draught.

Proposed by Mr. M. Tossell, 1866.

292. Plan of ventilating tube for escape of foul air from the magazines of sloops, to be fitted to the upper part of the magazine bulkhead, which will convey the tainted air into the holds or storerooms, to be dispersed through the hatchways.

The ventilator is made in three parts: the centre tube, which has two wire gauze webs fitted in the inside, will pass through the bulkhead, with inner and outer tubes one-third of its length to fit into it, having perforated faces and flanges for securing them with screws on both sides of the bulkheads. With this description of ventilator the magazine will be perfectly secure in the event of fire until the bulkhead should be burnt through; and in order that it may be opened only on the occasions of working the magazine, the outer end is fitted with a sliding shutter, which moves forward and back by the action of turning the key for locking and unlocking, which key should always be in the custody of a responsible person.

Proposed by Mr. William Ladd, master shipwright, at Woolwich Dockyard, and fitted in H.M.S. "NIOBE," 1867.

293. Half-section (on a $\frac{1}{2}$ -in. scale) of about 50 ft. of the midship part of H.M.S. "NYMPHE," launched 1866, showing the details of the ventilating arrangements on the plan of Dr. Edmonds, as adopted in that and other vessels.

- A. Ventilating trunks on each side of the ship, extending about three-fourths of her length, for withdrawing foul air from the bilges and lower deck.
- B. Holes, one in each opening, for ventilating the bilges.
- C. Holes, one in each opening, for ventilating the lower deck.
- D. Tubes for conveying the foul air from the trunks A to the hollow iron masts.
- E. Tubes for conveying the foul air from the trunks A to the funnel when it is up, or to the air casing round the funnel when it is down.

294. Sectional MODEL (on a $\frac{1}{4}$ -in. scale), showing the ventilating arrangements to engine room, stoke-hole, shaft, passage, &c., as generally adopted for ships in H.M. service. 1866.

295. Ventilating riding bitt on Harfield's plan. (This model will be found at Class VI., Division L., No. 327.)

CLASS V.—DIVISIONS J and K.

N.B.—There have been no models added to these Divisions since the Catalogue was published.

CLASS V.—DIVISION L.**SHOT-PROOF CONNING HOUSES, EVOLUTION
BRIDGES, &c.**

383. Section (on a $\frac{1}{2}$ -in. scale) of H.M.S. "NIOBE," launched 1866, showing the evolution bridge, with stanchions and ladders, the voice pipes for communicating with the engine room, and also the telegraph arrangement, as generally fitted to ships in H.M. service. 1866.

384. MODEL (on a $\frac{1}{4}$ -in. scale) of a portion of H.M.S. "LORD WARDEN," launched 1865, showing the arrangement for giving protection to the officers in the conning house and on the bridge. Chatham Yard. 1865.

CLASS V.—DIVISION M.**MISCELLANEOUS FITTINGS WHICH CANNOT
BE CLASSED UNDER ANY ONE OF THE
PRECEDING HEADS.**

404. MODEL (on a 1-in. scale) of a ship's dispensary, with all fittings, as generally adopted for ships in H.M. service. 1866.

405. Section (on a 1-in. scale), showing a ship's pantry, and all its internal fittings, as generally adopted for ships in H.M. service. 1866.

406. Section (on a $\frac{1}{2}$ -in. scale) of H.M.S. "NIOBE," launched 1866, showing the hammock berthing, with stanchions, wash boards, and brackets, rails, and battens for securing the hammocks; also shifting pieces over the ports, as generally fitted to ships in H.M. service. 1866.

CLASS VI.

Models of the various Articles and Appliances required for Use on board Ship.

Divisions.

- | | |
|--|---|
| <p>A.—Tanks.
B.—Pumps.
C.—Capstans.
D.—Windlasses.
E.—Screw jacks.
F.—Anchors, anchor stocks, &c.
G.—Buoys for anchors.
H.—Chains, chain cables, &c.
J.—Shackles for chain cables.
K.—Compressors for chain cables.
L.—Bitts for chain cables.
M.—Life buoys, life rafts, &c. (<i>See</i>
Boats, Class II.)
N.—Patterns of logs, and deep-sea
leads.</p> | <p>O.—Pendulums, telegraphs for steering
wheels and engine rooms, &c.
P.—Time glasses.
Q.—Ships' compasses and binnacles.
R.—Stoppers and shot plugs for iron
and wooden ships.
S.—Ships' lanterns for signalling,
fighting, &c.
T.—Galleyes, condensers, and portable
furniture, &c.
U.—Lightning conductors.
V.—Miscellaneous articles and appli-
ances which cannot be classed
under any of the preceding
heads.</p> |
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CLASS VI.—DIVISION A.

TANKS.

5. Four specimens, showing proposed improvements in the mode of fitting taps to deck tanks.

(a.) Tap No. 1 shows the fittings complete to deck tanks as hitherto supplied to the navy.

(b.) Tap No. 2 shows the proposed arrangement. The advantages claimed for the new plan (No. 2) are as follows, viz., 1st. The plate and bolts, which are unsightly in deck tanks, would be dispensed with. 2d. The tanks would not require to be taken to the smithery to be fitted. 3d. A saving would be effected on each tank in labour and materials. The principal feature in the improved plan is the square connected with the collar, which square is seated in a similar square cut in the tank to receive it, and which prevents its being unscrewed from the outside.

Proposed by Mr. Jones, Inspector of Tanks, Royal Victoria Yard, 1868; and ordered to be generally adopted.

CLASS VI.—DIVISION B.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS VI.—DIVISION C.**CAPSTANS.**

98. MODEL of the capstan used in the French Imperial Marine at the present time (1866), commonly known as the "Barbaton Capstan."

It is only capable of working one sized chain.

99. MODEL of a capstan fitted with Gordon's sprocket wheel for working a chain messenger. This was the plan adopted in H. M. Service prior to the improved capstan invented by Messrs. Brown and Harfield about the year 1860. See Catalogue, No. 68., p. 169.

100. MODEL (on a 1-inch scale) of a single wrought-iron capstan and cable-holder, with adjustable stops, on the plan patented by Messrs. Harfield & Co., as fitted in H.M. ship "NIOBE," launched 1866, showing also the direct lead of the chain cable, deck rollers, &c., as fitted to ships of the Royal Navy. 1866.

CLASS VI.—DIVISIONS D and E.

N.B.—There have been no models added to these Divisions since the Catalogue was published.

CLASS VI.—DIVISION F.**ANCHORS, ANCHOR STOCKS, &c.**

203. MODEL of an anchor, showing a plan for the two arms to be jointed at the crown so that they may both turn down flat upon the shank, but may turn back to a certain extent as the fluke enters the ground.

Proposed by Mr. Peter Dinzey, 1865.

CLASS VI.—DIVISION G.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS VI.—DIVISION H.

CHAINS, CHAIN CABLES, SLIP HOOKS, &c.

261. MODEL of Saunders' patent safety anchor springs. They are intended not to interfere with the ordinary use of the windlass, and when not in use to be stowed away in front of the bitts.

When the ship is riding in an exposed bay or roadstead the clutch-hook is to be fixed to the nearest convenient link of the cable, and a few inches of slack being given out from behind the strain is thrown upon the spring, which is to be 25 per cent. stronger than the cable, and by its elasticity to reduce the force of any sudden strain on both cable and windlass.

Proposed by Mr. Robert Saunders, 1867.

CLASS VI.—DIVISION J.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS VI.—DIVISION K.

COMPRESSORS FOR CHAIN CABLES.

306. Part of a deck, showing a chain cable compressor, fitted to work with a vertical lever, on a plan in use in the French navy in 1865, but different from that adopted in H.M. Service.

307. Two MODELS of Messrs. Brown & Harfield's patent cable stoppers. A is the plan first proposed and used in H.M. Service prior to 1865. B is the improved plan which was afterwards adopted, and is commonly known as the "Elongated Bow Stopper."

CLASS VI.—DIVISION L. BITTS FOR CHAIN CABLES.

327. Section (on a $\frac{1}{2}$ -inch scale) of the deck of H.M.S. "BELLEROPHON," launched 1865, showing the wrought-iron ventilating riding bitts, on the plan patented by Messrs. Harfield and Co., with the vertical web plates for connexion with the lower decks, as fitted in that and other ships, together with the chain cable, compressors, and controllers. 1866.

CLASS VI.—DIVISION M. LIFE BUOYS, LIFE RAFTS, &c.

(See CLASS II.—DIVISION D.)

CLASS VI.—DIVISION N.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS VI.—DIVISION O. PENDULUMS, TELEGRAPHS FOR STEERING WHEELS AND ENGINE ROOMS, &c.

360. Pendulum for showing the inclination of a ship for gunnery purposes. In this instrument the arc is transparent and lighted from behind to facilitate the reading being taken, and the pendulum is heavily weighted and travels on a rail.

Proposed by Mr. Henry Soper.

(This model will be found in the Catalogue at Class VI., Division O, No. 360, page 179.)

362. Protractor and gauge apparently to test the safe traverse of a gun, but it appears to be incomplete, and neither the name of the inventor nor any other particulars concerning it are known.

(This model will be found in the Catalogue at Class VI., Division O, No. 362, page 179.)

365. Clinometer for measuring the trim of a ship by the head or stern by means of a glass tube filled with a liquid. Patented by Mr. Berthon.

(This model will be found in the Catalogue at Class VI., Division O, No. 365, page 180.)

366. Pendulum in brass circular case, with index to show the greatest inclination of a ship.

By Mr. A. G. Edye, Mate, R.N., 1836, who subsequently made a further improvement by adding to it an instrument for recording the number of rolls.

(This model will be found in the Catalogue at Class VI., Division O, No. 366, page 180.)

372. MODEL (on a scale of 4 inches to a foot) of a steering telegraph. The arms of the telegraph marked port and starboard are placed at different angles to show the man at the wheel the number of turns to be given. Thus, angle No. 1 is one turn port or starboard, angle No. 2 two turns, &c., horizontal "hard to port" or "starboard." If less than one turn of the wheel be required, any smaller angle than No. 1 can be shown, being previously understood by the man at the wheel. The arm not shown means "steady." The answer is given by a corresponding portable telegraph at the wheel.

Proposed by Mr. James Kiddle, master of the "ASIA," 1867. Ordered to be tried in the "MINOTAUR."

373. Plan for a Steering Telegraph or Signal, proposed by Mr. George Read. 1867.

(This model, and further particulars concerning it, will be found in the Appendix at Class VIII., Division B, No. 95, page 81.)

374. Section (on a $\frac{1}{2}$ -inch scale) of H.M.S. Niobe, launched 1866, showing the evolution bridge with the voice pipes for communicating with the engine-room, and also the telegraph arrangement, as generally fitted to ships in H.M. Service. 1866.

(This model will be found in the Appendix at Class V., Division L, No. 383, page 67.)

CLASS VI.—DIVISIONS P and Q.

N.B. There have been no models added to these divisions since the Catalogue was published.

CLASS VI.—DIVISION R.

STOPPERS AND SHOT PLUGS FOR IRON AND WOODEN SHIPS.

435. Four MODELS (A, B, C, and D), showing Plans for shot plugs.

Proposed by Mr. Evelyn, and forwarded to the Admiralty in 1865 by Mr. T. M. Rickman.

436. MODEL of a plan for stopping leaks and shot-holes in the bottoms of iron ships, by attaching a piece of thick felt to the outside surface of the bottom (and so covering the hole), by means of pneumatic brackets or suckers.

Proposed by Commander Warren, R.N. 1866.

437. MODEL of a flexible shot-plug.

Proposed by Mr. James Kiddle, Master of the "ASIA." 1867.

438. MODEL of a plan for stopping shot-holes and leaks in a ship, by fixing a hose over the hole, and carrying the upper end of the hose above the water-line.

Proposed by Mr. F. Pellatt. 1867.

CLASS VI.—DIVISION S.

SHIPS' LANTERNS FOR SIGNALLING, FIGHTING, &c.

460. Patterns (A. and B.) of a lamp-holder and a candle-holder, to be secured against iron or other bulkheads by means of a pneumatic bracket or sucker. A. is the candle-holder. B. the lamp-holder.

Proposed by Commander Warren, R.N. 1866.

461. MODELS (on a 1-in. scale), of a bow and a paddle-box, showing the light boxes; also a light box, full size, as generally fitted to the ships in H.M. Service. 1866.

CLASS VI.—DIVISION T.

GALLEYS, CONDENSERS, AND PORTABLE FURNITURE, &c.

493. Plan of a distilling condenser, in which a number of plates are substituted for the tubes in the condensers at present in use. The inventor claims for it the advantages of cheapness, durability, and greater facility for repairs, and that it has one-third more condensing surface.

Proposed by Mr. J. S. Hargrave, coppersmith in Sheerness Factory. 1866.

494. MODEL of the seamen's mess shelves, as fitted on board the "PLOVER," twin-screw gun vessel of 663 tons, at Deptford Dockyard, 1867, and other ships in H.M. Service.

495. Section (on a 1-in. scale) showing the seamen's shelves, plate racks, &c., as generally fitted in the ships in H.M. Service. 1866.

496. Section (on a 1-in. scale) of H.M.S. "NIOBE," launched 1866, showing the seamen's bag racks, and the method of securing the mess tables and stools thereto, as generally fitted to the ships in H.M. Service. 1866.

CLASS VI.—DIVISION U.

LIGHTNING CONDUCTORS.

505. Section (on a $\frac{1}{2}$ -in. scale,) showing the method of fitting the lightning conductors to the masts, in connexion with the ship on the plan of Sir William Snow Harris, and adopted for all ships in H.M. Service. 1866.

CLASS VI.—DIVISION V.

MISCELLANEOUS ARTICLES AND APPLIANCES, WHICH CANNOT BE CLASSED UNDER ANY OF THE PRECEDING HEADS.

520. Model of a gauge for sounding the depth of water in the hold of a ship. The proposal is to have a hollow tin cylinder with an index attached to it, to float in another hollow cylinder open at the lower part, so that the water in the hold, if any, may rise to its level, bringing up the index of the gauge, which may then be read off.

Proposed by Mr. Gillson. 1861]

CLASS VII.

Models of the various Articles in connexion with the
Armament of Ships.*Divisions.*

- | | |
|--|---|
| A.—Carronades, with the carriages,
slides, tackle, &c. | E.—Shields, and plans for working
guns in them. |
| B.—Broadside guns, with the car-
riages, slides, tackle, &c. | F.—Plans for loading guns, cleaning
and transporting them, &c. |
| C.—Pivot guns, with the carriages,
slides, tackle, &c.; also the
arrangements in connexion
with the bulwarks to enable
guns to be fired clear of them. | G.—Rifles, bayonets, and other small
arms, and the fittings for them. |
| D.—Mortars or bombs, with the beds,
carriages, &c. | H.—Shot, shell, rockets, tubes, fuzes,
torpedoes, &c., and the fittings
for them. |
| | I.—Plans for heating shot and carry-
ing the same. |

CLASS VII.—DIVISION A.

CARRONADES, WITH THE CARRIAGES, SLIDES,
TACKLE, &c.

21. Section (on a $\frac{1}{2}$ -in. scale) showing a ship's port, with plates, bolts, sweep pieces, and other fittings for carronades, as generally adopted for ships in H.M. service, 1867.

CLASS VII.—DIVISION B.

BROADSIDE GUNS, WITH THE CARRIAGES,
SLIDES, TACKLE, &c.

91. Pattern screw for securing to the decks the metal curbs upon which $6\frac{1}{2}$ -ton, or 12-ton guns are to traverse.

Proposed by the Chatham officers, and adopted for the "LORD WARDEN" and "BELLEROPHON," in 1865.

92. MODEL (on a 1-inch scale) of a Rodman 15-inch gun, (American,) and carriage showing a plan for working heavy guns on the broadside.

Proposed by Capt. Ericsson of the United States of America in 1866.

93. MODEL shewing proposed mode of fitting the breeching bolts for securing the 12-ton guns, and also proposed position of eye-bolts for the side tackles in "BELLEROPHON," launched in 1865.

Proposed by the Chatham Officers 1865, and adopted with certain modifications.

94. MODEL (on a $1\frac{1}{2}$ -inch scale), showing a $6\frac{1}{2}$ -ton gun (marked A) mounted on the iron gun-carriage originally proposed by Captain R. A. E. Scott, R. N., for enabling heavy guns to be worked on the broadside. This plan with some slight modifications is that now (1868) generally adopted for all $6\frac{1}{2}$, 9, and 12-ton guns in the Royal Navy. The model also shows a proposed oval form of port for enabling a 12-ton gun (marked B) to be worked without increasing the size of the aperture.

Proposed by Captain R. A. E. Scott, R.N., in 1864, and ordered to be generally adopted for ships in H.M. Service.

95. Section (on a $\frac{1}{2}$ -inch scale) of a ship between decks, showing the ports and a $6\frac{1}{2}$ ton gun in position, with the ring, and shackle eyebolts to ports, training and rear tackle bolts and sockets in deck, dismounting cranks and bolts, muzzle lashing bolts, and all others; also the cranks and, hooks for stowing shell, grape, and canister boxes, sponge, stores, &c., as generally fitted to ships in H.M. Service.

1867.

96. MODEL of a part of the side of H.M.S. "Hercules," built 1868, with an 18-ton gun mounted, showing the amount of squaring of port and training of the guns which can be obtained at extreme elevation and depression.

Proposed by the Chatham Officers in 1866, and adopted with slight modification.

(This Model will be found at Class V., Division G., No. 207, Appendix, page 63.)

CLASS VII.—DIVISION C.

PIVOT GUNS, WITH THE CARRIAGES, SLIDES, TACKLE, &c., ALSO THE ARRANGEMENTS IN CONNEXION WITH THE BULWARKS TO ENABLE GUNS TO BE FIRED CLEAR OF THEM.

126. Two Models (A and B) of a plan for working guns.

(A.) represents a plan for loading and pointing the guns on the main deck of a vessel, then raising them by steam or other power through a circular aperture in the centre of the ship to the upper deck where the piece is run out and fired, and when at full recoil, lowered again to the main deck to be reloaded. Iron shutters are employed to close the aperture whilst the gun is below, and thus protect the men from splinters or the debris of shell. A pamphlet accompanies the model.

(B.) represents the same plan applied to a Land Fort.

Proposed by Capt. E. A. Inglefield, R.N., 1860.

127. MODEL of a plan proposed by Capt. King Hall, C.B., Superintendent of Sheerness Dockyard, to admit of a vessel of the "Favorite" class (launched in 1864), firing two guns forward and two aft inside her battery, and in a line with the keel. 1866.

128. Section (on a $\frac{1}{2}$ -inch scale) showing the upper deck of a ship, with a $6\frac{1}{2}$ -ton pivot gun in position, with radius and other plates, sockets, bolts, &c., as generally fitted to ships in H.M. Service. 1867.

129. MODEL showing a plan for a portion of the topside of H.M.S. "PENELOPE," launched in 1867, to be made removable so as to allow the main deck guns to be fired nearly in a fore and aft line.

Proposed by the Pembroke Officers. 1865.

CLASS VII.—DIVISION D.

N.B.—There have been no Models added to this Division since the Catalogue was published.

CLASS VII.—DIVISION E.**SHIELDS, AND THE PLANS FOR WORKING THE GUNS IN THEM.**

173. Plan for fighting guns under a shield placed on a turntable. Proposed by Mr. J. Moneypenny, 1864.

174. MODEL (on a $\frac{1}{4}$ -inch scale) of a plan for protecting the lower part of a turret, by placing a circular belt of armour plating close against the turret instead of armour plating the ship's side ; the model also shews (by removing the part marked A.) in the event of a portion of the side and deck of the ship being shot away, what support would remain for the cylindrical belt of armour plating.

Proposed by Capt. C. P. Coles, C.B. in 1866.

175. Sectional MODEL (on a 1-inch scale) of the after turret of the "ROYAL SOVEREIGN," converted to an iron-cased turret ship in 1864. Description as follows :

- (a) $\frac{1}{2}$ -inch iron tube-lining to port.
- (b) Radius iron beams. An aperture in top of turret, 6 ft. diameter for getting gun in and out.
- (c) $\frac{3}{4}$ -inch iron plating over beams.
- (d) Hook clamps riveted through top and beams.
- (e) Wood-wedges for additional security to upper part of armour plates.
- (f) An inner armour plate, 11ft. 6ins. by $4\frac{1}{2}$ ins., for additional strength to port.
- (g) Outer armour plate $5\frac{1}{2}$ inches thick.
- (h) Roller path.

This MODEL can be taken to pieces to show the construction. *In the Royal Naval Museum at Greenwich, June 1866.*

176. MODEL of one of the original shields or cupolas designed by Captain Cowper Coles, R.N., C.B., built in 1859, and fired at on board the "TRUSTY," floating battery, in September 1861. Its form, as will be seen from the model, was conical ; the cylindrical form was the one he afterwards adopted, as will be seen by referring to the model of the shield fitted in the "ROYAL SOVEREIGN." (See Class VII., Division E., No. 175, page 78, in the Appendix.)

The shield was struck 33 times, and at the conclusion of the firing it is stated that it worked with the same ease as before. Full particulars of the trial will be found in Parliamentary paper, No. 267, dated 11 May 1866.

CLASS VII.—DIVISION F.

N.B.—There have been no Models added to this Division since the Catalogue was published.

CLASS VII.—DIVISION G.

RIFLES, BAYONETS, AND OTHER SMALL ARMS,
AND THE FITTINGS FOR THEM.

223. One box with patterns, and three models descriptive of the various fittings for small arms, cutlasses, spare breechings, &c., for the fighting decks of ships of war; ordered to be generally adopted with a view to a uniform system. 1854.

224. Two MODELS (A & B) shewing two plans for arm stands. A shews the plan formerly in use, B the improved plan proposed by Capt. A. C. Key, and ordered to be generally adopted in 1863.

CLASS VII.—DIVISION H.

SHOT, SHELLS, ROCKETS, TUBES, FUZES, TORPEDOES, &c., AND THE FITTINGS FOR THEM.

270. MODEL (on a 1-inch scale) of an apparatus for firing 10-pounder war rockets from vessels, without permitting the back fire to enter the ship.

Proposed by Mr. W. Hale, in 1845, and tried on board H.M.S. "EXCELLENT" and at Shoeburyness in 1846.

271. Two full-sized MODELS. One of the common shell for a 7-inch muzzle-loading rifled gun, and one of the hollow bodied shot for the same gun. 1866.

CLASS VII.—DIVISION J.

N.B.—There have been no Models added to this Division since the Catalogue was published.

CLASS VIII.

Models of Steering Apparatus, permanent or temporary, with Stern Posts, Braces, and Pintles.

Divisions.

- | | |
|--|--|
| A.—Plans for permanent rudders, or
permanent substitutes for rudders. | C.—Plans for securing the rudder to
the ship. |
| B.—Plans for temporary or spare
rudders. | D.—Plans for working and locking
the rudder. |

CLASS VIII.—DIVISION A.

PLANS FOR PERMANENT RUDDERS, OR PER- MANENT SUBSTITUTES FOR RUDDERS.

46. Plan for steering ships by means of two rudders, one on each side of the ship, so fitted as to slide in and out.

Proposed by Mr. F. Martin, Assistant Master Shipwright, Sheerness. March 1862.

47. MODEL of steering apparatus, in which the rudder-post and bar are protected from shot, and the rudder is deep in the water. The model is divided into three portions—1st, the stern post; 2nd, the rudder which is intended to be of iron; 3rd, the plank to cover the bar of the rudder, which will work in the groove of the stern-post. In iron-clads the plank would not be used, but in lieu thereof the stern-post and bar of the rudder would be covered over with an iron casing of the same thickness as other parts of the ship. The model presumes that the ship draws twenty-one feet of water at her deep load line, and it is proposed that the bar of the rudder should be encased for one-third of that distance below the water, and the rudder itself should at the top be one third of the ship's draught from the surface of the water.

Proposed by Mr. G. S. Dracopule. 1867.

48. MODEL (on a $\frac{1}{2}$ -in. scale) of the balance rudder of H.M.S. "BELLEROPHON," launched in 1865, shewing the tiller and yoke with tiller-ropes and blocks, the paul or locking plate, and plate to secure the tiller &c.; also the rudder pendants and other fittings. 1867.

49. Plan for putting together the main piece of a rudder in three parts instead of making it out of one log, proposed to meet the difficulty at one time experienced in getting large pieces of English oak timber suitable for line-of-battle ships' rudders. To prevent the working of the Norman Head separating the pieces at the joint, a spider hoop, $1\frac{3}{4}$ ins. thick, is to be let down over the head, bolted through and firmly clenched.

Proposed by Mr. G. Rutter, Acting Timber Converter,
Pembroke Yard. 1860.

50. MODELS, (four in number, *a*, *b*, *c*, and *d*), of a twin balanced rudder, intended to give a better effect in steering, with a great reduction of power employed.

- (*a*) represents the twin balance rudder as fitted to a steam ship in the usual place abaft the propeller.
- (*b*) represents the rudder fitted to a steam ship before the propeller.
- (*c*) represents the rudder fitted to a sailing ship.
- (*d*) is a whole model of a ship with the twin balance rudder fitted to it, but in a somewhat different manner from that in which it is applied in the other models.

Presented by the inventor, Mr. Samuel Clarke. 1868.

CLASS VIII.—DIVISION B.

PLANS FOR TEMPORARY OR SPARE RUDDERS.

95. MODEL of a temporary rudder and temporary stern post to be kept ready on board a ship, to be lowered when wanted over the ship's side, with a bearing on the deck ; or if two such rudders were carried, they might be worked on the mizen channels. It is also proposed to place on the rudder head a sort of lantern, at such a height as to be seen above the bulwarks. The lantern is to turn with the rudder, so as to exhibit an illuminated S. when the helm is starboard, and P. when the helm is port, and M. when amidships, so that any other vessels approaching would see which way the ship is steering. By daylight large printed letters would be used instead of the lantern arrangement.

Proposed by Mr. George Read, officer in the Coast Guard Service, Deal 1867.

CLASS VIII.—DIVISION C.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS VIII.—DIVISION D.

PLANS FOR WORKING AND LOCKING THE RUDDER.

177. MODEL of a plan to enable the man at the wheel to check the rudder in case of the wheel ropes or tiller being carried away.

Proposed by Mr. J. C. Dixon, in 1865.

178. MODEL of a plan for steering ships in the following manner:—An iron shaft or rod passes completely through the body of the rudder over its after part; the shaft extends up through the counter and deck, where it is put in communication with gear attached to the steering-wheel which will make it revolve; the lower end of the rod comes out below the rudder, and has on it a small cog wheel. On the stern post, below the rudder, is fitted an iron or metal open frame, in the form of a quadrant of a circle, on the outer part of which there are teeth corresponding to the cogs in the small wheel just referred to; when the shaft is made to turn round it travels by means of the cogs along the circular arc, carrying the rudder with it.

Proposed by Mr. Peter Dinzey. 1865.

179. MODEL (on a $\frac{3}{4}$ -in. scale) of a plan for steering below the water-line for vessels of the "PLOVER" class, built 1866, or to be applied with suitable modifications to any other classes of ships in the navy.

Proposed by Mr. William Ord, Foreman of Fitters, Portsmouth Dockyard. 1867.

180. MODEL (on a 2-in. scale) of the wheel stanchions and steering wheel complete, with index plate and all fittings, as fitted in H.M.S. "BELLEROPHON," launched in 1865, and other ships of the Royal Navy. 1867.

181. MODEL of Fayerer and Robinson's patent safety steering wheel. This invention is intended to prevent the risk of having the wheel upset, or of the loss of the rudder, either from a violent stroke of the sea, or when the ship happens to have stern way. The helmsman is to step on the pedal ; and by bringing the compressing band into action he may fix the wheel and rudder as firmly for the time as if they were always immovable; and then as he relieves the pressure by easing up his foot the wheel becomes free. The apparatus, however, is intended to be so controllable that whenever requisite a dead lock may be avoided, and any lessened resistance applied. The pedal, as will be seen by a reference to the model, acts by powerful leverage upon what is termed the compressor, which is made of gun metal or wrought iron.

Description of the several parts.

- A. Compressor band. Metal.
 - B. Compressor band. Wood attached together.
 - C. Compressor wheel fixed to and turning with barrel of steering wheel. Wood.
 - D. Tangent screw regulating any expansion, contraction, or wear of bands. Metal.
 - E.E. Levers and foot pedals to act on bands. Metal.
 - F. Balance weight suspending action on bands. Metal.
 - G.G. Fulcrum of levers. Metal.
- Proposed by Commander Fayerer, R.N. 1865. Fitted for trial in the " NIOBE " at Woolwich.

182. Steering apparatus for steamers and sailing vessels.

Proposed by Mr. John Roberson. 1841.

CLASS IX.

Models of various Plans for the Propulsion of Ships.

Divisions.

A.—Plans for paddle-wheel propellers. | C.—Miscellaneous plans in connexion
B.—Plans for screw propellers. | with the propulsion of ships.

CLASS IX.—DIVISION A.

PLANS FOR PADDLE-WHEEL PROPELLERS.

18. MODEL of a central paddle-wheel, by which the inventor states the following advantages are to be obtained over the screw, viz.: 1st, It does not interfere with the steering of the ship. 2nd, A ship in action losing any of her spars, they fall over the side, and are almost certain to come in contact with the screw; with the centre paddle this is impossible. 3d, The screw may be injured by shot, the paddle can be protected. 4th, With a screw you cannot with certainty back astern, with the paddle you can. 5th, A ship under canvas would scarcely feel the impediment of the paddle, when the screw is always a drag. 6th, The centre paddle could easily be disconnected and allowed to revolve, and when necessary readily lifted up out of the shaft; and lastly, the body of water contained in the shaft would certainly prevent the ship rolling.

Proposed by Mr. R. Dawson. 1866.

19. MODEL of a new method of propelling ships, proposed by Major Scott Phillips, 1867. (The models will be found at Class I., Division A, Nos. 183 and 184, Appendix, page 10.)

20. MODELS (three in number, *a*, *b*, *c*) to illustrate a plan for propelling ships by constructing them with double sterns, and fixing a wheel or wheels between the two deadwoods. The wheel is intended to be immersed nearly up to its centre, and surrounded by a casing.

Proposed by Captain Ward, 1868.

21. Half Block Model (on an $\frac{1}{8}$ in. scale) of a vessel, showing a plan for propelling ships by means of floats, similar to those of the ordinary paddle-wheel, but attached to an endless chain passing over two rollers.

The name of the inventor of this plan and the date are not known.

CLASS IX.—DIVISION B.

PLANS FOR SCREW PROPELLERS.

40. MODEL of a screw propeller having the blades perforated with holes, by which it was supposed that the following advantages would be obtained, viz.: Less slip, less vibration, less weight, and less cost, with the same strength.

Proposed by the Hon. Major Fitzmaurice, 1865.

41. Plan to enable a screw, having only one bearing, to be feathered from inboard.

Proposed by Mr. John Farquharson, leading man of storehouses, Sheerness dockyard, 1867.

42. MODEL of a screw propeller designed to be used either as a four-bladed or two-bladed screw. 1860.

43. Two MODELS *a.* and *b.* illustrative of the difference between single and double screws, and indicating the mode in which they are made.

Presented by Mr. John Dinnen, R.N. 1860.

44. Model of a screw propeller designed to gain an increase of speed with a smaller expenditure of coal, and to diminish the vibration. The inventor states that the screw has a blade of circular outline in which the area originally employed is maintained, and a boss which tapers from the size of the forward bracket, to that of the after one, and is a continuation of the ship's run, and that from the form of the screw, also the aperture for the screw well might be smaller than with the ordinary or Griffith screw, and the ship's stern therefore stronger.

Proposed by Mr. David Rule, leading man of pattern makers, Keyham Yard. 1862.

CLASS IX.—DIVISION C.

MISCELLANEOUS PLANS IN CONNEXION WITH THE PROPULSION OF SHIPS.

59. MODEL of a ship's propeller, stated to be superior either to screw or paddle. It is proposed to be fixed in the stern of the ship below the water line, and connected by a shaft to the machinery in the ship; the propeller slides horizontally out and in, and as the casement or tube is occupied by the propeller it is emptied of the water, as it is filled with the water it is freed from the propeller, both in their turn acting as propeller powers.

Proposed by Mr. Robert Hamilton. 1866.

CLASS X.

Masts and Rigging.

- | | |
|--|---|
| A.—Model showing the rig of vessels at various periods. | J.—Plans for making, strengthening, and fitting yards. |
| B.—The masts, yards, tops, cross-trees, trestle-trees, caps, &c., according to the classification of Sir W. Symonds in 1836. | K.—Plans for mast-heads, tops, cross-trees, trestle-trees, and caps. |
| C.—Plans for stepping lower masts. | L.—Plans for fitting channels, shrouds, and stays, including deadeyes, hearts, thimbles, and hooks. |
| D.—Plans for raising, lowering, and fidding topmasts, topgallant masts, &c. | M.—Blocks and sheaves. |
| E.—Plans for making, strengthening, and fitting lower masts. | N.—Specimens of rope, &c., for rigging. |
| F.—Plans for making, strengthening, and fitting topmasts, topgallant masts, &c. | O.—Specimens of canvas for sails. |
| G.—Plans for making, strengthening, and fitting bowsprits. | P.—Models of masts, &c., showing the damage sustained by them in engagements with the enemy. |
| H.—Plans for making, strengthening, and fitting gaffs and booms. | Q.—All models in connexion with masts and rigging not included in the foregoing divisions. |

CLASS X.—DIVISION A.

MODELS SHOWING THE RIG OF VESSELS AT VARIOUS PERIODS.

9. MODEL (on a $\frac{1}{2}$ -inch scale) of the rig of a ship with *tripod* masts.

The model shows the tripod legs as in H.M.S. "WIVERN," launched 1863, not passing through the upper deck.

It is proposed in action not to send topgallant masts on deck, but to lower them down until landed in the top, when the fid can be put in. The topgallant masts when thus housed, being abaft all, would not interfere with the topsails.

Thetrysail mast is of wood.

A Cunningham topsail might be used if preferred. One of the principal objects in these masts is to have as little rigging aloft as possible when going into action. The topgallant and royal rigging should be sent down and everything unreefed except the gear actually necessary for working the topsails and fore and aft sails in action. These ropes in

a regular seagoing ship should be led down through and alongside the masts and legs to the deck below, so as to work the topsails without exposing the men.

The shrouds with ratlings are not intended for support, but merely for the men to go aloft by.

Proposed by Captain Cowper Coles, C.B. 1865.

A fully rigged model of a ship with *tripod* masts will be found at Class I., Division A., No. 156, page 53 in the Catalogue.

CLASS X.—DIVISIONS B and C.

N.B.—There have been no models added to these divisions since the catalogue was published.

CLASS X.—DIVISION D.

PLANS FOR RAISING, LOWERING, AND FIDDING TOPMASTS, TOPGALLANT MASTS, &c.

265. MODELS (two in number, *a* and *b*) descriptive of a plan for introducing top ropes for fidding and unfidding topmasts instead of toptackle pendants and falls. The advantages proposed to be gained by the plan are that it would reduce weight, be less expensive, and afford greater facility for getting top-masts up and down.

Proposed by Captain Edmonstone, of the Steam Reserve, Devonport, and fitted for trial in the "DONEGAL," "ZEALOUS," and "PRINCE CONSORT."

266. MODELS (twelve in number, *a* to *l*) showing a mode of fitting the heels of topmasts with an iron band and portable iron bolt, for the purpose of preventing the splitting of the heel of the topmasts, and the top rope from slipping out.

Proposed by the Devonport Officers, and ordered to be generally adopted. 1866.

CLASS X.—DIVISIONS E, F, and G.

N.B.—There have been no models added to these divisions since the catalogue was published.

CLASS X.—DIVISION H.**PLANS FOR MAKING, STRENGTHENING, AND FITTING GAFFS AND BOOMS.**

440. Rough MODEL of suggested improvements in the manner of fitting the trusses in the Indian troop ships of the "CROCODILE" class, also of fitting the gaffs of fore and aft sails generally.

Proposed by the Portsmouth Officers, 1866. Adopted for "CROCODILE," "SERAPIS," "JUMNA," "EUPHRATES," and "MALABAR."

CLASS X.—DIVISION J.**PLANS FOR MAKING, STRENGTHENING, AND FITTING YARDS.**

491. Sample of the steel used by Messrs. Westwood Baillie and Co. in the construction of steel yards.

Received from Mr. Baskcomb. 1866.

CLASS X.—DIVISION K.**PLANS FOR MASTHEADS, TOPS, CROSS-TREES, TRESTLE-TREES, AND CAPS.**

562. MODEL (on a 1-in. scale) of a plan for making iron caps in two parts. The after part of the cap to be made separate, and shrunk on the masthead as usual. The neck or collar of the cap to be made with "he" or "she" joints, with a slot or keyhole through them. The fore

part of the cap to be made separate, and fitted with key holes, &c., to the after part, already shrunk on the mast-head. A tapering key to be driven from the upper side of cap, through the two parts which would make a solid bearing and a dead lock. The sides to be secured with screws, as shown in MODEL.

The fore part of cap could be removed by taking out the key and screws, and then, by securing a studding sail boom or pole on the trestletree, with some 6 or 7 ft. above the masthead, and attaching a tackle the fore part of cap can be lowered down, and by the same process put in place again.

Proposed by Mr. Thomas Pattison. 1868.

CLASS X.—DIVISION L.

PLANS FOR FITTING CHANNELS, SHROUDS, AND STAYS, INCLUDING DEADEYES, HEARTS, THIMBLES, AND HOOKS.

636. Pattern of a spring hook and thimble to be used instead of lashings for jib and staysails.

Proposed by Mr. Balant. 1865.

637. Section (on a $\frac{1}{2}$ -in. scale) showing the channels, with the deadeyes and preventer plates, as generally fitted to ships in the Royal Navy. 1867.

CLASS X.—DIVISION M.

N.B.—There have been no models added to this division since the Catalogue was published.

CLASS X.—DIVISION N.

SPECIMENS OF ROPE, &c. FOR RIGGING, &c.

737. Specimens of cordage made by a machine, proposed by Mr. W. Hago, in 1865.

738. Further specimens of cordage made by the machine, proposed by Mr. W. Hago, in 1865. (See No. 737.)

CLASS X.—DIVISIONS O and P.

N.B.—There have been no models added to these divisions since the Catalogue was published.

CLASS. X—DIVISION Q.

ALL MODELS IN CONNEXION WITH MASTS AND
RIGGING NOT INCLUDED IN THE FORE-
GOING DIVISIONS.

824. MODEL showing a plan for enabling a double topsail (*i.e.* two sails) to be set on one topmast. The lower mast is given an additional length from the hounds to the cap, so that the yard for the lower or cap topsail, may be set on the cap of the lower mast, and the sail extend down to the lower yard. The yard of the upper topsail is set as usual, but this sail extends only as far down as the cap of the lower mast.

One of the principal advantages to be derived from this plan is that a vessel could go into action with her topmasts struck, and yet have her topsails (cap-topsails) set.

One or more of the masts of the "Hector," "Resistance," "Defence," "Valiant," "Minotaur," and other vessels were so fitted about the year 1861.

In this model the upper topsail is shown to be reefed from the deck on Cunningham's plan, but it is not necessarily so fitted.

CLASS XI.

Arrangements for launching Ships, hauling them up,
heaving them down, raising them in Floating
Docks, &c.

(For Dry Docks, see Class XII., Division B.)

12. Sectional floating dock. This dock is made up of a number of separate pontoons or camels placed side by side. Each section is in the form of a long rectangular watertight box, having a framework rising at each end to form the sides of the dock when the various sections are put together. At each end of each section there is a separate float or tank. These floats are attached to the section by gearing in such a way that the section itself may have water admitted into it and be sunk to any required depth. When a ship is to be docked on this apparatus, a sufficient number of the sections are placed side by side, and blocks prepared in a line across the middles of the sections; water is then let into the sections, and the dock lowered by means of the end floats to the proper depth to admit the ship, the floats giving stability to the whole while the pontoons are under water. The ship is then placed over the blocks and shored to the frames at the ends of the sections; the water is pumped out of the sections by steam pumps carried on the dock, and the dock, with the ship on it, rises until the vessel and the upper parts of the sections are above the water.

This plan was proposed in 1859 by Mr. Warder, late draughtsman in the office of the Controller of the Navy, and is a modification of a dock of American origin. The model is in two parts (A. and B.) A. represents one end of one section of the dock, and B. one end float.

(See Catalogue, Class XI., No. 12, page 245.)

13. A set of MODELS, seven in number, (*a*, *b*, *c*, *d*, *e*, and *f*), of a design for a floating dock for Bermuda.

(*a.*) Is a model (on a $\frac{3}{16}$ -inch scale) of an iron floating dock, designed by Mr. Jas. Campbell, of the firm of Campbell, Johnstone, & Co., engineers and

shipbuilders, Silvertown, Essex. The dock is designed to lift vessels of the "MINOTAUR" class with a displacement of about 10,000 tons; it is divided into 54 watertight compartments, formed by seven longitudinal decks, 10 watertight transverse bulkheads, and by the outside and inside skins. These compartments consist of load or upper chambers, balance or middle chambers, and air or lower chambers, for the several operations of raising or sinking required in docking ships; its most important feature is that it can be caulked by filling the load or upper chambers on one side with water, which brings the middle line or keel some 5 feet out of the water.

- (b.b.) Are caissons for the model (a.), and are placed in the ends of the dock before the vessel in the dock can be made dry.
- (c.) Is a model of a ship of the "MINOTAUR" class, and weighted to a corresponding displacement, so as to be used in the model (a.)
- (d.) Model of a tray or pontoon to be used in the model (a.) for the purpose of docking smaller vessels. These trays are sunk in the dock and a small vessel is hauled over it, when it is raised by the dock, emptied, and then floated out with the vessel on it, so that as many vessels may be docked and under repair at one time as there are trays.
- (e.) Model of a small vessel (say with 1,200 or 1,400 tons displacement) to be used with the tray (d.)
- (f.) Tank for working the models in.

This dock, with some slight modifications, is now (1868) being built by Messrs. Campbell, Johnstone, & Co. for the Admiralty, and will be stationed at Bermuda.

14. A set of MODELS, eight in number, (a, b, c, d, e, and f,) of a design for a floating dock for Bermuda.

- (a.) Is a model of an iron floating dock on a $\frac{3}{16}$ -inch scale, designed by Mr. Campbell, and capable of docking vessels of the "MINOTAUR" class, differing from the design shown in model No. 13, inasmuch as it is arranged to be heeled by means of spars instead of by watertight compartments erected on the upper part.

- (b.b.) Caissons.

- (c.c.) Section of the dock (a.), fitted to illustrate the method of heeling it over for repairs by means of spars.
- (d.d.) Two spare sets of spars for heeling over.
- (e.) Tray or pontoon similar to the model (d.) in the preceding set of models.
- (f.) Model of a small ship to illustrate the working of the tray (e.)

15. Series of MODELS (three in number, *a*, *b*, and *c*) illustrating the arrangements, part of which only were carried out, for hauling up at Haslar the gunboats which had been built for the Russian war.

- (a.) MODEL (on a $\frac{1}{50}$ -inch scale) representing the proposed general arrangements of the premises. The parts actually constructed were the longitudinal slipway about the centre of the yard, up which the boats are hauled, the transverse slipway at the top of the longitudinal slipway, along which the vessels are moved to take them to their berths. This was, however, only completed from the end next to Haslar Bridge, as far as the line A. The row of slips above this transverse slipway was also constructed with roofs over each, from the end next Haslar Bridge as far as the line B., and without roofs from B. to C.

The model also shows the following proposals which have not been carried out, *viz.*, a number of buildings, &c., proposed to be erected for the repair of the hulls and machinery of the gunboats if injured during war; also some launching slips at the Haslar Bridge side, which were proposed to be constructed for launching several of the boats at once direct from the blocks, if urgently required for immediate service.

The model also shows a proposal for damming back the water and forming a large basin, by which means the vessels might be launched at any state of the tide from the main slipway.

- (b.) Working MODEL (on a $\frac{1}{2}$ -inch scale). The lower part represents the transverse cradle and a portion of the transverse slipway, shown in model (a.), by means of which the boats after being hauled up the main slipway are moved along to the slips on which they are to be finally placed; it also shows

the method of hauling the boats on or off the transverse cradle by means of an endless chain to be worked by an engine:—the motion to be reversed by reversing the bolt or catch fixed in the piston. A screw was, however, substituted for this chain in the arrangements finally adopted. The upper part of the model represents one of the slips on which the boats are placed, and one of the cradles used for moving them. This cradle is constructed in two parts, so that after the boat has reached its destination, by drawing out the transverse timber slides the cradle may be removed, and the vessel be left resting on the blocks. A model of a boat is also shown on the cradle, with one of the temporary roofs proposed for those vessels for which the permanent roofs had not been constructed.

(c.) Working MODEL (on a $\frac{1}{6}$ -inch scale) of a proposed method for launching the gunboats at Haslar by means of an hydraulic lift. The vessel was to be either put on blocks on the hydraulic frame or on the upper cradle. In either case the arrangements were to be so made that a vessel would be ready to be put on as soon as the hydraulic frame was adjusted to the proper level. For letting down or launching a vessel it would be only necessary to turn off the water from the cylinders. It was supposed that the operations of launching a vessel and floating her from the camber need not occupy more than five minutes, and that the lift could be raised again to receive another vessel in about a quarter of an hour; and that two vessels an hour might be launched by this method. The model shows the upper cradle working on the lift. 1856.

16. Series of MODELS, four in number (*a*, *b*, *c*, and *d*), illustrative of a proposal for hauling up ships on slips, in order the better to preserve them from decay, and to leave more space available in the harbours.

Proposed by Mr. Scamp, Deputy Director of Works to the Admiralty about 1850.

(a.) MODEL (on a $\frac{1}{60}$ -inch scale) showing the general arrangement proposed with three rows of slips, the two higher ones being intended for ships in ordinary or requiring large repairs, and the lower

row for advanced ships, or those preparing for commission. On the plan shown by this model the ships are proposed to be hauled up an incline of 1 in 35, on a longitudinal cradle, worked by an engine. The proposed positions of the houses, workshops, and machinery for the fitting and repair of the ships are also shown.

(b.) MODEL (on a $\frac{1}{50}$ scale) representing a modification of the arrangement shown in the preceding model; viz., to dispense with the inclined plane, and instead thereof to raise the vessels in the following manner—that is, to place the vessel in a dock, and then to pump in water sufficient to float the vessel on to a cradle placed at the required level.

(c.) Working MODEL, on an enlarged scale ($\frac{1}{8}$ inch to a foot), of a portion of model (a.); viz., 10 of the slips on the two upper rows, a portion of the transverse slipway with the cradle on it, two of the slips on the lower row, and the whole of the longitudinal slipway, the two cradling docks, viz., the upper and shallower one for smaller vessels, and the lower and deeper one for larger vessels, and the caisson at the entrance of the lower dock on the principle introduced by Mr. Scamp, viz., to slide in and out of a groove of solid masonry, instead of having to pump the water in and out as formerly.

The Model also shows at the upper end a portion of the roof proposed to be erected over the ships, also three models of ships hauled up, the centre one, a 3-decker, being a model of the "ROYAL ALBERT."

The Model of the "ROYAL ALBERT" is shown on the longitudinal cradle, which is in two parts, united by transverse timbers which are intended to be drawn out when the ship reaches its position, and thus allow the cradle to be removed.

The ship, after being docked and placed on the longitudinal cradle, is drawn up till it reaches the transverse slipway, when the longitudinal cradle, with the ship on it, is placed on the transverse cradle, and is then drawn along the transverse slipway by an engine fixed at the side, till it reaches the slip on which the ship is to remain.

It is removed from the transverse cradle to the slip by the means shown in the next model (16 d).

- (d.) Working MODEL (on a 1-inch scale) of a section of one of the upper slips referred to above, showing a proposal for the vessels to be drawn off the transverse cradle on to their slip by means of an endless chain passing over rollers. On reaching its position the long shores for holding her in position on the slip are fixed, and the shores supporting her on the cradle are knocked away, leaving the vessel resting on the blocks; the cradle could then be removed. This model also shows a proposed arrangement of wedges by means of which, when it is required to remove the wedges which cause the blocks to take the ship, they may easily be driven out, and the blocks set free, by driving in the other system of wedges, shown in the model in the first set of blocks.

17. MODELS (on a $\frac{1}{16}$ -inch scale), two in number (*a* and *b*), of Clarke's Hydraulic Lift, for raising first-class ships of war.

- (a.) Represents the Lift itself, showing the altars, blocks, shores, &c., and the sliding caissons at the entrance. The Lift is intended to be raised by hydraulic power.
- (b.) Represents what is commonly called a "Saucer," "Pontoon," or "Tray," which is used in the following manner:—The dock with the saucer in it having been lowered to a sufficient depth, the ship is floated on to the saucer; the dock and saucer are then raised by means of pumps sufficiently to allow the water to run out of the saucer through the open valves; the valves are then closed, the dock again lowered a few inches, and the saucer, with the ship on it, put afloat, independent of the dock, leaving the dock available for docking a ship, or for repeating the same operation again with another saucer. When the ship has been repaired, and is to be removed from the saucer, they are again placed in the floating dock to be lowered and the ship set afloat.

18. Two MODELS (A. and B.) illustrative of plans to overcome friction in moving heavy bodies, as for instance, in hauling up ships or afterwards placing them afloat again. 1862.

Proposed by Mr. Scamp, Deputy Director of Works. 1861.

19. MODEL (on a $\frac{1}{2}$ -inch scale) of a plan for launching vessels from a slip.

- (a.) Represents the slip, blocks, and transverse slipway on which the transverse cradle moves.
- (b.) Is the longitudinal slipway, down or up which the vessels are moved on the longitudinal cradle.
- (c.) Represents the longitudinal cradle with transverse tramways on the top corresponding with the transverse slipway.
- (d.) Represents the transverse cradle in five pieces, which is slipped under the vessel and fixed by the moveable timbers, as shown in the model.

Proposed by Mr. Scamp, Deputy Director of Works to the Admiralty. 1856.

20. MODEL (on a $\frac{1}{25}$ -inch scale) of a design for lifting vessels of about 3,000 tons, and laying them up on slips in a seagoing state, with the exception of ordnance stores, coals, water, and victuals, so as to be ready for sea at a short notice.

The proposed arrangement was as follows:—The vessel to be hauled up is first placed on a floating dock in deep water. The water is pumped out of the dock sufficiently to enable it, with the vessel on it, to be placed in shallow water over the permanent ways opposite the slip on which the vessel is to be hauled up. The dock is then lowered till it rests on the ways, when the vessel, being now on a level with the slip, is hauled off, and the dock is available for repeating the same operation with other vessels.

Designed by Mr. Scamp, Deputy Director of Works to the Admiralty. 1862.

(See Catalogue, Class XII., Division B., No. 30, page 247.)

CLASS XII.

Models of Buildings, Breakwaters, &c.

Divisions.

- | | |
|--|---|
| A.—Dockyards, Admiralty houses,
hospitals, &c. | C.—Models of sheers, derricks,
cranes, &c. |
| B.—Dry docks, basins, building
sheds, timber sheds, &c. | D.—Breakwaters, &c. |
| | E.—Semaphores, beacons, buoys, &c. |

DIVISION A.

DOCKYARDS, ADMIRALTY HOUSES, HOSPITALS,
&c.

4. General MODEL (on a $\frac{1}{30}$ -inch scale) of the harbours at Malta, showing the recent extension of the Great Harbour, with a proposed canal between the Great Harbour and the Quarantine Harbour. 1864.

5. MODEL (on a $\frac{1}{40}$ -inch scale) of the French and Dock-yard Creeks at Malta, showing the position finally decided on for the new dock in French Creek. 1865.

6. General MODEL (on a $\frac{1}{30}$ scale) of the northern part of Devonport Dockyard, showing proposed alterations, and the space to be gained by excavating the rock north of saw mills, and the road to the south of the saw mills. 1845.

7. MODEL (on a $\frac{1}{2}$ -inch scale) of the fireproof storehouses erected at Devonport Dockyard. The outside walls are of brick, $22\frac{1}{2}$ inches thick. The roof, floors, pillars, and girders supporting them, and the window sashes, are all of iron. Built about 1814.

8. MODEL (on a $\frac{1}{4}$ -inch scale) of the entrance gateway to Keyham Dockyard, in three parts, *a*, *b*, and *c*. (*b*) and (*c*) are moveable, (*b*) representing the gateway as originally designed can be removed and replaced by (*a*), which shows the gateway as actually built. Designed by Mr. Scamp. 1854.

9. MODEL (on a $\frac{1}{8}$ -inch scale) of the head of a jetty, with a steamer alongside, being part of a plan proposed for

coaling ships with great rapidity at Clarence Victualling Yard by means of hydraulic power.

Proposed by Captain James, R.E. 1850.

10. MODEL of the wall round the part of Portsmouth Dockyard added by the extension scheme approved in 1866, showing a proposal for overhanging watch towers to enable the officer or person on guard to look along the outside of the wall.

11. MODEL (on $\frac{1}{5}$ -inch scale) of Sheerness Dockyard. The foundation for a large portion of this yard is made by piling, as shown in the model, nearly 1,000,000 piles being driven in the construction of the works. The dockyard was commenced in the latter part of the year 1813, the first pile being driven on the 23rd December 1813.

The works were completed and opened for the public service on 23rd September 1823.

The engineering works cost 1,616,757*l.* They were designed by Mr. George Rennie and executed under his directions.

The architectural works cost 969,326*l.* These were designed by Mr. Hole, Civil Architect to the Admiralty, and executed under his directions. The total cost of the works was 2,586,083*l.*

This is the original working model by which the works were actually constructed; but additions have been made to it since, so that it correctly represents the changes which have been made up to the year 1840. The water front only is exhibited for want of space. The remainder is carefully preserved in store.

CLASS XII.—DIVISION B.

DRY DOCKS, BASINS, BUILDING SHEDS,
TIMBER SHEDS, &c.

(For Floating Docks, see Class XI.)

31. MODELS, three in number (*a*, *b*, and *c*), of zinc roofing.

(*a.*) Sheet zinc roofing with rolls.

(*b.*) Steinkeller's patent diamond zinc slates.

(*c.*) Steinkeller's patent square zinc slates.

Proposed by Mr. William Laird of Liverpool.

CLASS XII.—DIVISION D.

BREAKWATERS, &c.

63. General MODEL (on a $\frac{1}{500}$ -inch scale) in polished Devonshire marble of Plymouth breakwater.

This magnificent breakwater has been thrown across the entrance of Plymouth Sound for the protection of the anchorage. It was projected in 1806, actually commenced on 12th August 1812. It made its first appearance above the surface of the Sound at low-water mark, spring tide on 31st March 1813, and was completed about the year 1856. It was designed by Messrs. Rennie, Whidbey, and Hemans. Its western extremity is placed about 210 fathoms to the northward of the shoal of the Panther, and extending towards Bovisand Bay directly across the shoal of the Shovel, terminates in the vicinity of Staddon Point, from which it is distant 360 fathoms. The central division of this breakwater makes an angle with the true meridian of N. 86° W., and is in length 3,000 feet, from each end of which an arm or head projects to the distance of 1,050 feet more, so as to shut in that part of the Sound which lies to the south-eastward of a straight line drawn from Penlee to Dunstone Points.

It is composed of large blocks of limestone or gray marble taken from a quarry at Oreston, on the eastern shore of Catwater, consisting of a surface of 25 acres, which was purchased from the Duke of Bedford for the sum of 10,000*l.* The blocks varied in weight from one to five tons.

On the 19th January 1817 Plymouth Sound was visited by a tremendous gale, of such magnitude that it was the general opinion that but for the breakwater the whole of the ships inside must have been wrecked, and the Victualling Yard and most of the buildings on the margin of the sea swept away. The breakwater, however, prevented any damage to either, but did not escape without injury itself. About 200 yards in length and 30 yards in width of the upper stratum were displaced, and the whole of the huge stones, from two to five tons in weight each, carried over and deposited on the northern slope of the breakwater.

After that a considerable portion of the sea front was cased with masonry of immense masses of stone, but smoothly and beautifully laid; and the better to protect this the foot of the slope was extended seaward, in order to protect the foot of the masonry, by throwing in a great quantity of large and rubble stones.

A lighthouse was completed on the western end of the breakwater in 1844. The total cost of the breakwater was about 1,562,000*l.* (See Catalogue Class XII., Division D, No. 63, page 247.)

64. MODEL of a section of an iron wave-screen, proposed for Deal Sand, to shelter the small Downs, the object being to stop the wave at the surface without obstructing too much of the current, and destroying the scour over the bottom.
Proposed July 1844.

CLASS XII.—DIVISION E.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS XIII.

Plans and Compositions for the Preservation of Ships' Bottoms, Iron Work, &c. from the Effect of Time and Sea Water; also Specimens showing Damage done by the same.

Divisions.

- | | |
|--|---|
| <p>A.—Specimens of composition, &c. for preserving timber, iron, copper, &c.</p> <p>B.—Plans for preserving ships' bottoms, iron work, &c., by coppering, galvanizing, &c.</p> <p>C.—Specimens of the formation of fungus, barnacles, mussel shells, coral, weed, &c. on the bottoms of ships.</p> | <p>D.—Specimens of copper and iron bolts, sheathing, &c., after having been for some time in use.</p> <p>E.—Specimens of the effect on timber, &c., of the <i>teredo navalis</i>, white ant, dry rot, &c.</p> <p>F.—Relics of the "ROYAL GEORGE," sunk at Spithead in 1782, recovered in 1839 by Col. Pasley.</p> |
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CLASS XIII.—DIVISION A.

SPECIMENS OF COMPOSITION, &c. FOR PRESERVING TIMBER, IRON, COPPER. &c.

27. Specimen of a composition for preventing the bottoms of iron ships from getting foul.

Proposed by Messrs. McMillan & Co. 1865.

28. Three specimens of "pure carbon paint," for covering all external surfaces exposed to water or atmospheric influences.

Received from Mr. J. Walker. 1865.

29. Specimen of a composition for preventing oxidation and fouling on the bottom of iron ships; stated to be of such a nature that nothing in the sea or on land will adhere to it.

Proposed by Mr. John Chester. 1866.

30. Specimens (two in number, *a* and *b*) of Westwood and Baillie's patent composition for coating iron ships, so as to prevent oxidation, and to enable them to be coppered. It was also proposed for coating the sides of iron-clad ships of war between the wood backing and the skin plating of the ship's side, to protect the iron from corrosion, and form a solid foundation for the wood backing, as the patent composition adheres to both iron and timber. It was likewise intended to assist the fastenings of the wood backing, and render them perfectly watertight. The specimens show the composition applied both to wood and iron.

Proposed by Messrs. Westwood and Baillie, 1867, in connexion with a plan of theirs for sheathing iron ships with wood.

31. Specimens (two in number, *a* and *b*) of compositions to preserve iron, wood, ropes, &c. They are said not to contain any pitch or tar, but are intended to resist the action of water, rust, or foul air.

Proposed by Mr. Joseph Fenton. 1866.

32. Specimen of iron coated with a soluble silicate, and then with red lead paint, and afterwards immersed in sea water for about two months, from the end of February to the beginning of April 1865. This method of treatment was proposed by the Chemical Department, Portsmouth Dockyard.

33. Specimens of iron plates coated with Hay's waterproof glue and Portland cement, to test various plans for the purpose of protecting the under side of iron decks from corrosion.

(a.) Hay's waterproof glue put on alone.

(b.) Mixture of Hay's waterproof glue and Portland cement, put on with a trowel—one coat.

(c.) Mixture of Hay's waterproof glue and Portland cement, put on with a brush—two coats.

These specimens were prepared at Portsmouth Dock-yard. 1866.

34. Specimen of a composition to prevent corrosion, taken from the bottom of the "FRIEDERICH KARL," Prussian ship, built of iron. Taken off at Devonport. 1868.

35. Specimen of Mr. Bielefield's patent fibrous slab, proposed by Captain R. Scott, R.N., as a substitute for wood for lining the insides of iron ships; he considered that being impervious to damp it would protect the iron from corrosion. 1865. (The specimen will be found at Class XVII., No. 26, page 114, Appendix.)

36. Specimens (six in number, *a, b, c, d, e, f*) of various substances coated with Colonel S. Zerelmy's composition, showing the extent to which it preserved them from corrosion or decay under the different treatments stated against them to which they were afterwards subjected.

- (*a*) Plate of ship iron.
- (*b*) Piece of sheet iron which was immersed in the sea from 21 August 1852 to September 1856.
- (*c*) Piece of common deal which was immersed in the sea from 21 August 1852 to September 1862.
- (*d*) A piece of timber which was immersed in the sea for some considerable time.
- (*e*) A railway sleeper which was buried from 1852 to 1862.
- (*f*) A piece of timber which was buried in India from 1856 to 1860 in ground infested with white ants.

CLASS XIII.—DIVISION B.

PLANS FOR PRESERVING SHIPS' BOTTOMS, IRONWORK, &c., BY COPPERING, GALVA- NIZING, &c.

68. Two MODELS, showing plans for applying zinc directly to the bottoms of iron ships to preserve them from corrosion; applicable to ships already built, as well as to vessels built expressly with a view to being sheathed.

Proposed by Mr. Hay, of Portsmouth Dockyard. 1866.

69. Five MODELS of Mulley's improved method of metal sheathing iron ships.

The metal sheathing is applied by interposing a wooden skin, which is first trimmed and fitted close to the bottom of the ship, then morticed for the holdfasts, bedded in a suitable composition, and secured by the introduction of screws or rivets from the front. The rivets are put in hot

in the usual way, passed through an iron tube to avoid burning the wood. The hollow part of the holdfast is filled in with wood at the plank edges, and with cement. The iron holdfasts, spaced about 4 feet apart, are meant to act as dowels, and grasp at once the entire breadth of plank, and thus effect a cohesion of all the parts, the fastening screws or rivets being at the same time protected by intervening wood or cement. Red pine or hackmatack is proposed for the sheathing under the metal, which is intended to be carried up to the load water-line, the two or three strakes above that height to be of teak.

Proposed by Mr. W. R. Mulley. 1866.

70. Plan for coppering iron ships, adopted in some of the French men of war. The specimen has been immersed in the sea for 15 months. The copper is applied in the following manner :—First the iron is covered with a minims paint, then with one or more coats of mastic, intended to serve as an insulator ; over this is placed a thin covering of sheet lead, and on this again is placed the copper sheathing. The whole is fastened to the iron bottom by copper rivets driven into holes which are drilled about half through the iron, and are countersunk on the inside.

Proposed by Monsieur Le Capitaine de Roux. 1866.

71. MODEL of a plan for sheathing iron ships with zinc. Portsmouth Yard. 1867.

72. Specimen of a bolt or rivet proposed to be used in securing wood sheathing to iron ships, with a view to enabling them to be coppered. The plan is as follows :—The rivets to be manufactured with a hole in their head to receive the bolt ; they could be tapped either before or after the rivet is in place. The advantages of having the hole made at the same time as the bolt would be that a saving of both labour and material would be effected, and it would insure the hole being in the centre of the rivet head, and also its being square to the ship's side. This plan might be adopted for ships already built.

Proposed by Mr. R. Barnaby and Mr. J. Dealler. 1866.

73. MODEL to illustrate Commander Warren's plan of sheathing iron ships with copper, or other metal sheathing. His plan is as follows : The parts of the vessel to be sheathed are first covered with a coating of fibrous material attached to the vessel by means of Hay's waterproof glue or other suitable adhesive composition. The coating of fibrous material is intended to be further secured to the vessel by a

band of wood secured by screws. One side of the Muntz's metal or other sheathing is also to be covered with a coating of fibrous material attached to it by the waterproof glue or other composition. The sheathing is then made to adhere to the surface prepared for it by another application of glue or composition, and further secured by split pins or rivets of copper passing through it, and formed with curved or angular points, so that, on being passed through the sheathing and material attached thereto and driven home, they shall, on coming into contact with the inner layer of fibrous material, be opened out or clenched so as firmly to secure the sheathing to the ship's side.

Proposed by Commander F. P. Warren, R.N. 1863.

74. Specimens of zinc rivet nails so annealed (although of zinc) as to bend as readily as copper, for attaching metal sheathing to iron ships, on Commander Warren's plan. (See preceding Model, No. 73.) *See also Model 70*

Proposed by Commander F. Warren, R.N. 1866.

75. MODEL, illustrative of a plan for constructing iron ships and sheathing them with copper. The ships are constructed with plates of iron of the usual thickness and size, and upon the principle of what is termed butt or flush joints horizontally as well as vertically, having strips or bands on the inside of the plates, and with a double row of rivets or two double rows of rivets, as is usual with flush joints; but the edges of the plates are not allowed to touch each other, but are kept about half an inch apart for the purpose of being caulked, or filled in between and around the plates with strips of hard india rubber or teak, into which holes are bored if necessary, in order to fix on metal sheathing with suitable short nails. The butt joint is thus really converted into two capjoints; sheets of insulating material being also interposed between the metal sheathing and the ship's side.

Proposed by Mr. T. B. Daft. 1863.

76. Six specimens showing a proposal for attaching copper to the bottoms of iron ships by means of hot pitch. Glass, canvass, wire, or gauze, &c., are proposed to be placed between the copper and iron, partly to act as insulators and partly to increase the power of adhesion.

Proposed by Mr. John White, of Finchley. 1867.

77. Plan for preserving the bottoms of iron ships by sheathing them with zinc.

Proposed by Messrs. Dudgeon. 1867.

CLASS XIV.

Tools, Machines, and Machinery.

Divisions.

- A.—Hand Tools.
 - B.—Machines for dock-yards.
 - C.—Steam engines and boilers.
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CLASS XIV.—DIVISION A.

N.B.—There have been no models added to this Division since the Catalogue was published.

CLASS XIV.—DIVISION B.

MACHINES FOR THE DOCKYARDS.

51. MODEL of a furnace for heating and re-heating armour plates for bending. The plate could by this means be heated where required without the whole plate being heated, and thus avoid the necessity of using hydraulic pressure, which at times results in breaking the plate.

Proposed by Mr. G. T. Welch, 1866.

52. MODELS of upper and lower cutters of a shearing machine in use at Pembroke Dockyard for cutting to shape the bracket plates for iron ships, and such like jobs. 1865.

53. A MODEL of a truck for carrying boilers, and other heavy articles, fitted with two sets of wheels set at right angles so that the truck may be moved either forwards, backwards, or sideways without being turned round, by throwing one set of wheels out of gear and the other in.

1860.

54. MODEL of a truck for moving boilers, &c., fitted with two large centre wheels and four small ones, two on either side of the large wheels, the latter being arranged to serve for guiding wheels to regulate the direction in which the truck is to move.

1860.

55. MODEL of a truck with wheels fitted to run on a tramway or railway; also fitted with rails for the purpose of receiving a waggon or carriage from a tramway of a higher level. Proposed by Mr. Edward Allen, 40, Parliament Street, Westminster, and lately (May 1867) ordered to be fitted on board H.M. steam sloop "Spartan" 350 (collective) nominal horse power.

56. Specimen of a portion of a saw, showing how the teeth can be cut and the saw completely sharpened, without the use of files, by the saw sharpening machine invented by the Plymouth Foundry and Engine Works Company. The cutting or sharpening is effected by a patent emery disc revolving at great speed. 1867.

CLASS XIV.—DIVISION C.

STEAM ENGINES AND BOILERS.

81. MODEL of patent double expansive single-cylinder engine adapted for driving a screw propeller. These engines are designed for working steam very expansively, and are consequently specially adapted for higher pressures than those now commonly in use in steam vessels, 50 lbs. being the pressure intended to be employed in the engines above referred to. The cylinder is made double the ordinary length, or four times the length of the crank, and is divided into two parts by an annular partition, through which partition a trunk works having a piston at each end. Steam from the boiler is admitted alternately into the annular spaces on each side of the partition, and is cut off by the lap of the valve at about $\frac{5}{8}$ ths of the stroke, (or earlier, when required, by link motion,) and after this partial expansion passes into the respective ends of the cylinder, where it is fully expanded to a pressure proportionate to the relative capacities of the cylinder and the annular spaces around the trunk. The intended arrangement of the parts in these engines is shown in the model, but it may be varied as required for engines constructed for special purposes.

Proposed by Mr. Edward Ellis Allen, 40, Parliament Street, Westminster, and lately (May 1867) ordered to be fitted on board H.M. steam sloop "Spartan" 350 (collective) nominal horse power.

82. MODEL of a plan for repairing tubes of steam-boilers at the place where they generally first give way or leak, at or near the connexion with the tube plate or near their mouths. The invention consists of a split ring or gland,

which is first painted over with a mixture of white and red lead, and cast-iron borings, and while still moist the gland is inserted into the defective tube. The new piece of tubing is then inserted within this gland or split ring and driven home. The forced expansion of the ring completely fills up and renders watertight the defective tube, the operation being scarcely more troublesome than driving a nail, and very much less laborious than removing the tube for repair.

Invented by Mr. Edward Clark of New York, 1865.

Under trial.

83. How's patent salinometer. The use of this instrument is to indicate the exact time at which marine steam boilers should be blown off, so as to prevent a wasteful expenditure of hot water and consequently of fuel by blowing off too often, and on the other hand to avoid the risk of the metal of the boilers becoming burnt or a bad conductor of heat by a deposition of salt. On turning the stopeocks connecting the instrument with the boiler, the body of the salinometer becomes filled with a sample of water drawn from the interior of the boiler, which is continuous by means of the overflow pipe, the temperature and saline properties of which are constantly tested, and the necessity or not for blowing off is seen by the engineer by looking at the scale of the hydrometer floating in it, which rises higher in the water in proportion as the water becomes more saturated with saline matter; when the word "blow" is at the surface it shows that at the temperature of 200° Fahrenheit there are $2\frac{1}{2}$ lbs. of salt in every 32 lbs. of water held in solution in the boiler, and that it is necessary to admit fresh water, the neglect of which exposes the boiler to incrustation. The temperature of the water in the salinometer should be kept at 200° Fahrenheit, which may be done by regulating the flow of water from the boiler. 1860.

84. Three specimens of salinometers or hydrometers for testing the saltiness of water in marine boilers, in order to tell when they should be blown off. By Mr. Buss, London.

1860.

85. Specimens (four in number, *a*, *b*, *c*, *d*) of expanding drifts made of steel, being a species of large punches for enlarging holes already made in iron plates.

Proposed by Mr. Boffey, foreman of boiler makers, Sheerness Yard. 1861.

86. Specimen (full size) of a sluice valve of a simple form. 1867.

87. Specimen of Joublin's chains used in the French Navy for removing the incrustation which accumulates on the outside of boiler tubes. The mode of using them is to pass them round the tube and draw them backwards and forwards till the deposit is removed.

Proposed by Lieut. Denayrouze, of the French Navy.
1867.

88. Two MODELS (*a* and *b*) of the interior of marine boilers. (*a*), which is a model of the boiler of the steamer "DIAMOND," represents the ordinary tubular boiler, with the fire-box, funnel, tubes, &c. (*b*) represents a modification of the ordinary boiler, six additional fire-boxes being introduced for the purpose apparently of breaking up the flame, and thus preventing the heat from escaping too rapidly up the funnel. Neither the name of the inventor, nor any further particulars concerning it are known.

89. Specimen of a blow-off cock (full size). This cock is placed in the bottom of a vessel, with a pipe leading to the bottom of the boiler, and is used for getting rid of the sediment which accumulates on the bottom of the boiler. When the cock is opened the pressure of the steam in the boiler forces the sediment through the pipe into the sea.

1866.

90. Pattern of improved patent furnace bar for marine boilers. These bars are so constructed that they can be tilted by means of an eccentric so as to get rid of the ashes and prevent the accumulation of clinker on them.

Proposed by Mr. W. A. Martin, 1867.

CLASS XV.

Figure-heads, Busts, Carvings, &c.

N.B.—There have been no models added to this Class since the Catalogue was published.

CLASS XVI.

Drawings, Paintings, &c.

N.B.—There have been no models added to this Class since the Catalogue was published.

CLASS XVII.

Miscellaneous, to include all that cannot be classed under any of the foregoing heads.

22. Four specimens of a cork material for the construction of boats, buoys, pontoons, powder cases, &c., and for lining the insides of iron ships between decks.

Proposed by Mr. T. C. Clarkson. 1865.

23. Specimen of a copper bolt with a wire passing through it, which was intended to be used as a Government mark, but was not adopted as it caused the bolts to break in driving, as shown by this piece. 1865.

24. MODEL of a plan for clearing the anchorages in the Baltic of infernal machines, proposed during the Crimean war, 1855. Two steamers are to be fitted with spars (the ordinary spars in each ship are available for the purpose) projecting over the bows, the lower part being immediately below the keel and extending on each side beyond the width of the steamer at the paddle boxes; the steamers to be kept about half a cable apart, abreast of each other, with a strong hawser from the bows of each, and another hawser as a sweep between the ships. On the bight of each, iron creepers are attached, to drag on or near the bottom, so as to hook any infernal machines that may be lying on the space between the steamers.

Proposed by Rear-Admiral Sir William H. Hall, K.C.B., F.R.S. 1855.

25. MODEL of the scaffolding used in building the Nelson Column, in Trafalgar Square.

26. Specimen of Mr. Bielefield's patent fibrous slab, proposed by Captain R. Scott, R.N., as a substitute for wood for lining the insides of iron ships; he considered that it would be more lasting, that being waterproof it would protect the iron from corrosion, and in the event of a shot passing through that it would not splinter. Captain Scott was also of opinion that if the outsides of armour plates were covered with it, it would considerably increase their resistance to shot. 1862.

PART II.

COLLECTION OF PAINTINGS & MODELS FROM PRIVATE SOURCES.

PAINTINGS, DRAWINGS, &c.

44. A drawing of the port disposition of the frame of H.M.S. "AMETHYST," wrecked in Bovesand Bay, Plymouth Sound, in 1811. Her top side timbers had been continuously bolted, when last repaired according to the plan proposed by the late "Joseph Tucker," Esq., surveyor of the Navy, and after having been 21 days on the rocks during a gale of wind, she was floated off to Plymouth Dockyard, with unbroken sheer.

Presented by Mr. John Scott Tucker.

45. Drawing of a proposed 4-decked ship, the "DUKE OF KENT" 170 guns, planned and proposed by the late "Joseph Tucker" Esq., surveyor of the Navy. 1813-1831.

Presented by Mr. John Scott Tucker.

46. Engraving of "Lumley's" rudder, showing its modifications. Lent by Mr. H. Lumley, Assoc. I.N.A.

47. Coloured engraving of Capt. E. Bedford's, R.N., uniform code for the distinction of buoys by colour.

Presented by Capt. E. G. Bedford, R.N.

48. Painting in oil. A launch at Deptford dockyard. English, middle of the 18th centy. By J. Cleveley.

49 to 63. The following drawings, &c., have been lent by Mr. John Scott Russell, F.R.S., and are all of ships built by him.

49. Longitudinal drawing of the "GREAT EASTERN" steamship.

50. Drawing of the cross section of the "GREAT EASTERN" steamship.

51. Water colour drawing of the "GREAT EASTERN" steamship, off the Isle of Wight.

52. Oil painting of the "GREAT EASTERN" steamship going through the Downs.

53. Oil painting of the "GREAT EASTERN" steamship, leaving the river Medway, off Sheerness.

54. Oil painting of the Royal West India Mail Company's fleet in Southampton Water.

55. Water colour drawing of the Sydney and Melbourne Royal Mail Steam Packet Company's paddle steamer "PACIFIC," tons 1,470, horse power 500.

56. Drawings of the engines of the Sydney and Melbourne Royal Mail Steam Packet Company's steamer "PACIFIC."

57. Water colour drawing of the Prussian man-of-war paddle steamer, "DANTZIC." Guns 12. Horse power 400, and Prussian frigates.

58. Water colour drawing of the Prussian paddle gun-boats "NIX" and "SALAMANDER."

59. Water colour drawing of "DANTZIC," "NIX," and "SALAMANDER" at gunnery practice.

60. Water colour drawing of a four masted screw steamer.

61. Water colour drawing of a four masted sailing ship in a gale of wind.

62. Water colour drawing of a screw steamer.

63. Water colour drawing of the launch of a frigate at Millwall.

64. Two engravings showing elevation, longitudinal section, &c., of improved life boat, arranged to pack one in the other.

Presented by Mr. George Fawcett, North Shields.

65. The American packet ship "WARREN" under jury masts and temporary rudder. These were fitted after her own had been carried away by a storm in the Mid-Atlantic, and enabled her to reach England in safety.

Painted by Mr. George Mears.

66. Oil painting of a Dutch man-of-war. By A. Stork.
Lent by Mr. T. Dyer Edwardes.

67. Oil painting of an action between Maltese and Algerine vessels. By Vanvitelli, 1647—1736.

Lent by Mr. T. Dyer Edwardes.

68. Oil painting of Maltese men-of-war at anchor. By Vanvitelli, 1647—1736. Lent by Mr. T. Dyer Edwardes.

69. Picture of Dutch men-of-war. By Johannes Coesermans.
Lent by Mr. T. Dyer Edwardes.

70. Oil painting of Dutch shipping. By Van Ass.

Lent by Mr. T. Dyer Edwardes.

71. Twenty-three engravings of shipping, &c., of different periods. Presented by Mr. T. Dyer Edwardes.

72. Photograph of the fore topsail of Lord Nelson's ship "VICTORY," after the battle of Trafalgar in 1805.

Presented by Mr. S. Willcocks, Master Sailmaker,
H.M. Dockyard, Sheerness.

MODELS.

164.* HALF MODEL of Messrs. Westwood and Baillie's design for an armour-plated turret ship, showing broadside, fore and aft angular firing. Tons 6,300. Guns 22. Horse power 1,160. Lent by Messrs. Westwood and Baillie.

165. MODEL of section of a vessel with masts and sails on the flat surface principle.

Presented by Lieut. W. Congalton, R.N.R.

166. MODEL of the Montreal Ocean Steamship Company's screw steamers "HIBERNIA" and "NORWEGIAN." Tons 2,041. Nominal horse power 400. Designed and built by W. Denny, Brothers, Dumbarton.

This MODEL shows on the port side the internal arrangements of cabins, engine-room, &c.

Lent by Messrs. W. Denny, Brothers, Dumbarton, N.B.

167. HALF MODEL of Messrs. Jardine, Mathison, and Co's paddle steamer "GLENGYLE," constructed for the navigation of the river Yangtze. Tons 2,040, nominal horse power 400. Designed and built by W. Denny, Brothers, Dumbarton.

Presented by W. Denny, Brothers, Dumbarton, N.B.

168. "Fawcus's" improved blocks for lowering ship's boats, with necessary fittings for boat's side, thwarts, &c.

Presented by Mr. George Fawcus, North Shields.

169. Three MODELS showing various systems of "Lumley's" patent rudder.

Invented by H. Lumley, Assoc. I.N.A. See No. 36, p. 197.

170. Yoke and crutches, made from a brass gun taken in Sebastopol, 8th September, 1855. Presented to the late Capt. Crispin, R.N. Lent by Mrs. Crispin.

171. HALF MODEL of the iron sailing ship, "VICTORY." Tons 1,198. Built 1863. Designed and built by Messrs. Laurence Hill and Co.

Presented by Messrs. Laurence Hill and Co., Glasgow.

172. MODEL of a patent topmast, designed by Captain Turnbull.

Presented by Messrs. Laurence Hill, and Co. Glasgow.

173. MODEL of a ship's bulwarks fitted with "Fawcus's" patent revolving head davits, for lowering and stowing boats promptly.

Lent by Mr. George Fawcus, North Shields.

174. Two MODELS showing arrangements of boat-chocks with sliding wedge pieces, on Mr. Fawcus's plan.

Lent by Mr. George Fawcus, North Shields.

175. MODEL of the Eddystone Lighthouse, made by George Knott, for many years lightkeeper on the rock.

Lent by the Corporation of the Trinity House.

176. MODEL of the Light Ship stationed on the Goodwin Sands, with lanterns, and all fitments complete for day and night service. Tons 195.

Lent by the Corporation of the Trinity House.

177. MODEL of the first iron steamers built on the Thames, the "LORD W. BENTINCK," "MAGNA," and "JUMNA," in 1832, for the Honourable East India Company, for the navigation of the river Ganges.

Designed and built by Messrs. Maudslay, Sons, and Field.

Presented by Messrs. Maudslay, Sons, and Field.

178. MODEL of the stern of a ship fitted with J. Scott Tucker's proposed balance rudder, which can only be unshipped when at right angles with the keel.

Presented by Mr. J. S. Tucker.

179. Two MODELS showing "Fawcus's" new mode of constructing boats, so that several of the same size and shape may be packed together indiscriminately.

Lent by Mr. G. Fawcus, North Shields.

180. MODEL of a double rudder fitted to stern of a screw steamer. Proposed by Lieut. the Hon. J. Fitzmaurice, R.N.

Lent by Lieut. the Hon. J. Fitzmaurice, R.N.

181. The original mast-head swivel actually used on Mr. Dempster's yacht "PROBLEM." Exhibited with the model of the yacht in Admiralty collection, No. 364, class 1, division B.

Lent by Mr. H. Dempster, H.E.I.C.S

182. MODEL of the screw steamer "CITY OF PARIS," belonging to the Liverpool, New York, and Philadelphia Steam Shipping Company (*Inman Line*); tons 2,740, nominal horse power 550. Launched December 1865.

Presented by the Inman Company, Liverpool.

183. MODEL of "Blake's" method for ventilating troop ships. Presented by the Rev. J. Hardie.

184. MODEL of "Blake's" single hook for futtock shrouds. Presented by the Rev. J. Hardie.

185. MODEL of "Blake's" plan for adding power to the rudders of gunboats, and vessels of light draught. Presented by the Rev. J. Hardie.

186. Two MODELS of "Blake's" patent fids, and plans for fidding topmasts. Presented by the Rev. J. Hardie.

187. MODEL of "Blake's" stoppers and fid for shortening the bowsprit. Presented by the Rev. J. Hardie.

188. MODEL of "Blake's" tumbler hook for letting go the sheet of a boat in cases of emergency. Presented by the Rev. J. Hardie.

189. MODEL of two half sterns of a first-rate ship showing "Blake's" method for the framing of the timber, &c., and gallery. Presented by the Rev. J. Hardie.

190. MODEL of "Blake's" plan for the prevention of water entering a ship, in the event of any accident to the screw. Presented by the Rev. J. Hardie.

191. Two MODELS, one iron and one wood, for steps of lower masts, on "Blake's" plan. Presented by the Rev. J. Hardie.

192. MODEL showing "Blake's" stoppers for letting go anchors. Presented by the Rev. J. Hardie.

193. MODEL of "Blake's" plan for barring in the ports, and showing method of ventilation. Presented by the Rev. J. Hardie.

194. MODEL of "Blake's" plan showing alteration in method of securing shrouds, and doing away with lower deadeyes. Presented by the Rev. J. Hardie.

195. "Blake's" proposed deadeyes for all ships. Presented by the Rev. J. Hardie.

196. Five plans (on "Blake's" principle) for toggles. Presented by the Rev. J. Hardie.

- 197.** Screw eye bolt (on "Blake's" plan).
Presented by the Rev. J. Hardie.
- 198.** MODEL of "Blake's" plan for connecting beams to ship's side.
Presented by the Rev. J. Hardie.
- 199.** "Blake's" improved stopper-bolt.
Presented by the Rev. J. Hardie.
- 200.** MODEL of "Blake's" plan for constructing a temporary rudder.
Presented by the Rev. J. Hardie.
- 201.** MODEL of "Blake's" slip hook for mooring chains.
Presented by the Rev. J. Hardie.
- 202.** MODEL on "Blake's" plan of futtock timbers, fitted with side chock.
Presented by the Rev. J. Hardie.
- 203.** MODEL on "Blake's" plan of futtock timber with side scarf.
Presented by the Rev. J. Hardie.
- 204.** MODEL on "Blake's" plan of futtock to dispense with angle chock.
Presented by the Rev. J. Hardie.
- 205.** MODEL on "Blake's" plan of two floors, made good with chocks at the side of keel.
- 206.** MODEL of floor and first buttock, united together on the old plan.
Presented by the Rev. J. Hardie.
- 207.** MODEL of common floor timber, chocked at the heel on the side of keel.
Presented by the Rev. J. Hardie.
- 208.** MODEL, on "Blake's" plan, of two bent floor timbers, with saw-kerf in middle of moulding side, to assist the bending.
Presented by the Rev. J. Hardie.
- 209.** SPECIMEN of zinc sheathing for iron vessels ("Daft's" patent). Patented September 1863.
[In place of Specimen, No. 151, Part 2.]
Presented by Mr. T. B. Daft, C.E.
- 210.** Specimens of fishing nets used in the French fisheries.
Presented by Mr. C. W. Merrifield, F.R.S.
- 211.** MODEL of Cunningham's self-reefing topsail, or plan for reefing from the deck. Invented by Henry D. P. Cunningham, 1850.
Lent by Mr. H. D. P. Cunningham.
- 212.** MODEL of the iron sailing ship "DURHAM," tons 998. Designed and built by Messrs. Oswald & Co.
Lent by Messrs. Oswald & Co., Sunderland.
- 213.** MODEL of an iron screw steamer, built and designed by Messrs. Oswald & Co. for the Baltic or Mediterranean trade, tons 550, nominal horse power 100.
Lent by Messrs. Oswald & Co., Sunderland.

214. MODEL of the iron screw steamer "MEDWAY," tons 1,464, nominal horse power 250. Designed and built by Messrs. Oswald & Co.

This steamer was employed, in conjunction with the "GREAT EASTERN" steamship, in laying the Atlantic telegraph cable, 1866.

Lent by Messrs. Oswald & Co., Sunderland.

215—222. Series of MODELS, presented by R. Napier and Sons, illustrating a system of Plans for combined turret and broadside navies, by Vice-Admiral Edward Pellew Halsted, designed by C. F. Henwood, Esq., naval architect, on the turret and tripod mast system of Captain Cowper P. Coles, R.N., C.B.

The armament adopted for these ships of war is wholly on the system for rifled ordnance of Joseph Whitworth, Esq., F.R.S., and mounted on the muzzle-pivoting gun-carriages of Captain Heathorn, R.A.

A. Whole MODEL, full rigged, of "DREADNOUGHT," 1st rate.

Turrets	-	-	-	7
Number of guns in turrets	-	-	14, of 9-in. calibre.	
" broadside guns	-	-	4, of 7-in. "	
" " "	-	-	10, of 4-in. "	
Tons	-	-	-	10,764, builders' measurement.
Nominal horse power	-	-	-	1,300

B. Whole MODEL, full rigged, of corvette "ACTIVE," 6th rate.

Turrets	-	-	-	2
Number of guns in turrets	-	-	4, of 9-in. calibre.	
" broadside guns	-	-	10, of 7-in. "	
Tons	-	-	-	4,926, builders' measurement.
Nominal horse power	-	-	-	1,000

C. Whole MODEL of ocean despatch vessel "VEDETTE," 8th rate.

Turrets	-	-	-	1
Number of guns in turret	-	-	2, of 9-in. calibre.	
" broadside guns	-	-	10, of 5½-in. "	
Tons	-	-	-	3,684, builders' measurement.
Nominal horse power	-	-	-	800

216. Series of half-block MODELS, from 1st to 5th rate, showing the proposed internal fittings and arrangements of Vice-Admiral Halsted's turret ships.

217. MODEL of midship section of turret ships, proposed by Vice-Admiral Halsted.

218. MODEL, showing portion of main deck battery, of Vice-Admiral Halsted's combined turret and broadside ships.

219. MODEL of R. Napier's patent 2-gun turret, designed for Vice-Admiral Halsted's proposed system.

220. MODEL for illustrating the bow-line of fire, on Vice-Admiral Halsted's system of turret ships.

221. Four MODELS of steel screw boats, designed by Vice-Admiral Halsted for his combined turret and broadside ships.

1. Launch.

Length	- - -	50 feet.
Guns	- - -	2 ten-pounders.
Oars	- - -	22

2. Pinnace.

Length	- - -	45 feet.
Guns	- - -	2 ten-pounders.
Oars	- - -	20

3. First Cutter.

Length	- - -	35 feet.
Guns	- - -	2 two-pounders.
Oars	- - -	14

4. Second Cutter.

Length	- - -	30 feet.
Guns	- - -	2 two-pounders.
Oars	- - -	12

The engines for these boats specially designed by J. Penn, Esq., F.R.S.

222. SECTION, full size, showing portion of strake and gunwale of steel boats, with metal crutch.

Designed by Vice-Admiral Halsted.

223. MODEL of a steering wheel, known as the "Niagara" wheel.

Lent by Mr. Andrew Murray, chief engineer H.M. Dockyard, Portsmouth.

224. Series of PROJECTILES, contributed by the Whitworth Armoury Company (Limited), Manchester, showing calibres from a 2-pr. to a 9-in. or 320-pr. rifled gun.

Proposed for Vice-Admiral Halsted's system of turret and broadside ships of war.

225. MODEL of Berthon's patent collapsible troop boats.

Length	50 feet.
Beam	14 feet.
Depth	6 feet 3 inches.
Oars	12
Troops	200

Lent by the Rev. E. L. Berthon, Romsey, Hants.

226. Berthon's patent Nautachometer or perpetual log, for indicating speed of ships.

Lent by the Rev. E. L. Berthon, Romsey, Hants.

227. Berthon's patent bi-fluid Clinometer, for showing the oscillation, pitching, and scending of ships, and also their trim.

Lent by the Rev. E. L. Berthon, Romsey, Hants.

228. Whole MODEL of the Cunard iron paddle steamer "SCOTIA," length 366 ft., beam 47 ft. 6 in., tonnage 4,050, builders' measurement, nominal horse power 1,000. Built 1861. Constructed for the British and North American Royal Mail Steam Packet Company by R. Napier & Sons.

Presented by R. Napier & Sons, Glasgow.

229. Whole MODEL of the Turkish iron armour-clad screw frigates "OSMANEA," "AZIZEA," and "ORKHANEA," length 293 ft., beam 36 ft., tonnage 4,222, builders' measurement, 42 guns, nominal horse power 900. Constructed for the Imperial Ottoman Government by R. Napier & Sons.

Presented by R. Napier & Sons, Glasgow.

230. MODEL of R. Napier & Sons' patent screw steering gear, as usually fitted by them to large ocean steam ships.

Presented by R. Napier & Sons, Glasgow.

231. MODEL showing section of a boat with two guns, and apparatus for working them, on Mr. Walker's plan.

Lent by Mr. J. Walker.

232. MODEL of a 3-gun battery, showing the working of the guns on Mr. Walker's plan. Lent by Mr. J. Walker.**233.** MODEL of a floating battery of 3 guns, on Mr. J. Walker's plan. Lent by Mr. J. Walker.**234.** MODEL of the section of a ship's side.

Lent by Mr. J. Walker.

235. MODEL of the section of a ship's side, with armour plates attached. Lent by Mr. J. Walker.**235a.** MODELS of six Chinese boats, and one Chinese junk. Presented by Mr. J. Pybus.

236. MODEL of Captain Hurst's patent bulwark life raft, complete. Lent by Captain J. W. Hurst, M.M.

237. MODEL showing mode of fitting Hurst's patent bulwark life raft to waist-bulwarks of a ship.

Lent by Captain J. W. Hurst, M.M.

238. MODEL of the Viceroy of Egypt's yacht, for the river Nile.

Presented by the Egyptian Commissioner for the Paris Exhibition of 1867.

239. MODEL of the American river steamer "EMPIRE," running between New York and Albany.

Presented by Mr. D. Lapraike.

240. Working MODEL of Clifford's patent boat-lowering apparatus.

Lent by Mr. Charles Ralph.

241. Series of MODELS, 1 to 59.

Lent by Mr. Scott Russell, F.R.S.

These models illustrate the gradual developement of Mr. Scott Russell's wave-line system, and exhibit every intermediate step from the square box (No. 59) to the complete theoretical rendering of the idea in fig. 1.

The different models represent the experimental forms used for comparison; and the following are some of the most successful steamers and yachts which have been built upon the wave-line system.

3. The paddle-wheel steamer "BARON OSY," London and Antwerp trader.

5. A small screw steamer.

8. The Sydney and Melbourne Royal Mail Steam Packet Company's paddle steamer "PACIFIC," 1,470 tons, 500 horse-power.

12. A long collier.

13. A small screw steamer.

14. A paddle steamer of the "HALDER" class.

17. A lengthened screw collier of the "EAGLE" and "CAROLINE" class.

20. The Prussian man-of-war paddle steamer "DANTZIC," 12 guns, 400 horse-power.

21. The London, Brighton, and South Coast Railway Company's paddle steamer "ROUEN."

22. A screw steamer.

24. The paddle-wheel yacht "WAVE QUEEN."

34. The "UNDINE" yacht, belonging to the Duke of Sutherland.
 35. The "THEMIS" yacht.
 36. The "TITANIA" yacht.
 42. Section of H.M.S. "WARRIOR," as originally designed by Mr. J. S. RUSSELL, F.R.S.

242. The contractor's MODEL actually used for the construction of the "GREAT EASTERN" steamship, showing size and fittings, &c., of the exterior iron plating.

Designed by Mr. I. K. Brunel, F.R.S.

Built by J. Scott Russell, F.R.S. This ship was designed in 1852, laid down in 1853, built 1857.

Lent by Mr. John Scott Russell, F.R.S.

243. The contractor's MODEL actually used for the construction of the "GREAT EASTERN" steamship, showing size and fittings, &c., of the interior iron plating.

Lent by Mr. John Scott Russell, F.R.S.

244. MODEL of the stern of the "GREAT EASTERN" steamship. Lent by Mr. John Scott Russell, F.R.S.

245. MODEL of the schooner yacht "AMERICA," length 95 ft., beam 22 ft., tons 210. Built 1851.

Designed by Mr. Steers, New York.

Lent by Mr. John Scott Russell, F.R.S.

246. Figure head for a ship, full size.

Lent by Mr. R. Hall.

247. Balance rudder and arrangement of stern for twin screw steamships (iron built). Proposed by Mr. C. W. Merrifield, F.R.S. Lent by Mr. C. W. Merrifield, F.R.S.

248. Arrangement and balance of weights of H.M.S. "PIQUE."

MODEL presented by Mr. John Edye, C.B., to Royal School of Naval Architecture.

Lent by the School.

249. Arrangement and balance of weights of one of H.M. steam ships.

MODEL presented by Mr. J. Edye, C.B., to Royal School of Naval Architecture.

Lent by the School.

250. A Pantameter, No. 1 size. For indicating the specific gravity of iron, wood, and coal, the sectional area of bars, and the cubic contents of any body that will go into the machine.

Lent by Mr. A. M. Bennett.

251. MODEL of 7-in. breech-loading "Armstrong" rifled gun, complete with sights and vent piece. Manufactured at the gun factory, Royal Arsenal, Woolwich.

252. Illustrations of guns and projectiles, as used in the Royal Navy, 1866. From Royal Arsenal, Woolwich.

1. WOOD MODEL of 7-inch muzzle loading wrought iron gun, rifled.
2. WOOD MODEL of 32-pounder gun.
3. WOOD MODEL of 13-inch. Sea service mortar.
4. 8-inch grummet wad.
5. 8-inch junk wad.
6. Two whole fuze metal caps.
7. Four sections of fuze metal caps.
8. Carcass, riveted teak.
9. Tin cup, for 7-inch breech-loading Armstrong gun.
10. Dyer's pattern metal percussion fuze, complete, for Armstrong gun.
11. Pillar's pattern metal percussion fuze, complete, for Armstrong gun.
12. Pettman's pattern metal percussion fuze, complete, for land service.
13. Pettman's pattern metal percussion fuze, complete, for sea service.
14. Armstrong pattern E, metal time fuze, complete.
15. Boxer's pattern metal time fuze, $7\frac{1}{2}$ seconds, complete.
16. Boxer's pattern metal time fuze, 20 seconds, complete.
17. Boxer's pattern 2-inch wood time fuze, for rifled ordnance.
18. Common pattern wood fuze, complete.
19. Diaphragm wood fuze, complete.
20. Hand grenade wood fuze, complete.
21. Large mortar wood fuze, complete.
22. Small mortar wood fuze, complete.
23. A section, empty, of Dyer's pattern Armstrong percussion fuze.
24. A section, empty, of Pillar's pattern Armstrong percussion fuze.
25. A section, empty, of Pettman's percussion fuze, for land service.
26. A section, empty, of Pettman's percussion fuze, for sea service.
27. A section, empty, of Armstrong pattern E. metal time fuze.
28. A section, empty, of Boxer's pattern $7\frac{1}{2}$ seconds metal time fuze.
29. A section, empty, of Boxer's pattern 20 seconds metal time fuze.
30. A section of Dyer's pattern Armstrong percussion fuze, filled for firing.
31. A section of Pillar's pattern Armstrong percussion fuze, filled for firing.

32. A section of Pettman's land service percussion fuze, filled for firing.
33. A section of Pettman's sea service percussion fuze, filled for firing.
34. A section of Armstrong pattern E metal time fuze, filled for firing.
35. A section of Boxer's pattern $7\frac{1}{2}$ seconds metal time fuze, filled for firing.
36. A section of Boxer's pattern 20 seconds metal time fuze, filled for firing.
37. A section of Boxer's 2-inch rifled ordnance wood time fuze, filled for firing.
38. A section of common wood time fuze, filled for firing.
39. A section of hand grenade wood fuze, filled for firing.
40. A section of diaphragm wood fuze, filled for firing.
41. A section of wood fuze for large mortar, filled for firing.
42. A section of wood fuze for small mortar, filled for firing.
43. A lubricator 7-inch breech loading service cartridge, complete.
44. A section of lubricator 7-inch breech-loading service cartridge.
45. Two large Armstrong shells, with string loops in shell.
46. A small Armstrong shell, with string loops in shell.
47. A common shell plug, in shells.
48. A diaphragm shrapnel shell plug, in shell.
49. A Martin shell plug, in shell.
50. A naval shell plug, in shell.
51. A 7-inch breech-loading hollow shot plug, in shot.
52. A 12-pounder Congreve rocket war shell, whole.
53. A section, filled, of 12-pounder Congreve rocket war shell.
54. A common Armstrong, 7-inch, breech-loading shell, empty.
55. A section, with plug, of a common Armstrong, 7-inch, breech-loading shell, empty.
56. Segment of Armstrong, 7-inch, breech-loading shell, section with loose segments empty.
57. Section segment of 7-inch breech-loading shell, with Boxer's time fuze, and adapter fitted.
58. Section of 12-pounder breech-loading shell, empty.
59. Section of 12-pounder breech-loading shell, with burster, and time percussion fuze.
60. Section of diaphragm shrapnel shell, with section of plug, empty.
61. Section of 8-inch or 68-pounder, riveted teak, diaphragm shell, filled, with section of fuze.
62. Section of 8-inch or 68-pounder, riveted teak, Martin shell, filled.
63. Section of 13-inch shell, for mortar, filled, with section of fuze.

64. Section of 8-inch or 68-pounder naval shell, riveted teak, and section of plug, empty.
65. Common 24-pounder shell, riveted, empty.
66. 8-inch, or 68-pounder, diaphragm shrapnel shell, riveted teak, empty.
67. Sea-service hand grenade shell, empty.
68. 8-inch, or 68-pounder, Martin shell, riveted teak, empty.
69. 150-pounder naval shell, riveted elm top, empty.
70. 8-inch, or 68-pounder, naval shell, riveted teak bottom, empty.
71. 13-inch mortar shell, filled.
72. 12-pounder, case, Howitzer shell.
73. Caffin's 8-inch, or 68-pounder, grape-shot shell.
74. Solid, loose, 68-pounder shot.
75. Solid, riveted, 12-pounder shot.
76. Armstrong, breech-loading, 64-pounder service shot.
77. Armstrong, breech-loading, 7-inch shot.
78. 12-pounder, service, Congreve rocket stick.
79. Friction copper tube.
80. Section of friction copper tube.
81. Quill friction tube, with loops.
82. Section of quill friction tube.

253. MODEL of a forecastle of a ship of war, fitted, showing pivots, racers, &c., to enable the guns and carriages to be shifted from one position to another for firing in any direction.

From Royal Arsenal, Woolwich. 1867.

254. MODEL of a mortar bed, complete, showing the method adopted (1866) for fitting it to the deck of a ship of war so as to obtain an all round fire.

From Royal Arsenal, Woolwich. 1867.

255. Half MODEL of the Peninsular and Oriental Company's Screw Steamer "DELHI;" tons 1,898, horse power 400. Makers of the engines, Messrs. Ravenhill, Salkeld, and Company. Launched September 1863. Built by Messrs. Money, Wigram, and Sons.

Lent by the Peninsular and Oriental Steam Navigation Company.

256. Half MODEL of the Peninsular and Oriental Company's Screw Steamer "CHARKIEH." Tons 1,615, horse power 350. Makers of the engines, Messrs. J. and G. Rennie. Launched December 1864. Built by the Thames Iron Works Company, Limited.

Lent by the Peninsular and Oriental Steam Navigation Company.

257. Half MODEL of the Peninsular and Oriental Company's Screw Steamer "DAKAHLIEH." Tons 1,553, horse

power 350. Makers of the engines, Messrs. J. and G. Rennie. Launched February 1865. Built by Messrs. Money, Wigram, and Sons.

Lent by the Peninsular and Oriental Steam Navigation Company.

258. Half MODEL of the Peninsular and Oriental Company's Screw Steamer "TANJORE." Tons 1,971, horse power 400. Makers of the engines, Messrs. Ravenhill, Salkeld, and Company. Launched April 1865. Built by the Thames Iron Works Company, Limited.

Lent by the Peninsular and Oriental Steam Navigation Company.

259. Half MODEL of the Peninsular and Oriental Company's Screw Steamer "SURAT." Tons 2,578, horse power 500. Makers of the engines, Messrs. C. A. Day and Company. Launched March 1866. Built by Messrs. C. A. Day and Company, Southampton.

Lent by the Peninsular and Oriental Steam Navigation Company.

260. MODEL of the West India and Pacific Steam Shipping Company's screw steamer, "VENEZUELAN," tons 1,682, horse power, 220. Makers of the engines, Messrs. Jas. Jack and Company, Liverpool. Launched, 1865. Built by Messrs. Jones, Quiggin, and Company, Liverpool.

Lent by the West India and Pacific Steam Shipping Company.

261. MODEL of the West India and Pacific Steam Shipping Company's screw steamer, "BOLIVAR," tons 1,250, horse power 200. Maker of the engines, J. C. Thompson, Newcastle-on-Tyne. Launched, 1862. Built by Messrs. Richardson, Duck, and Company, Stockton-on-Tees.

Lent by the West India and Pacific Steam Shipping Company.

263. Cap worn by sailors on board the "INFERNAL" Bomb Ketch, commanded by the Hon. Capt. Perceval (Lord Egmont), at the siege of Algiers, in 1816.

Presented by Sir W. Trevelyan, Bart.

264. MODEL of 400 horse power engines, fitted to the screw steamer "A. LOPEZ," of the Spanish Mail Service. (Scale 3 inches to 1 foot.)

Lent by the makers Messrs. William Denny and Brothers, Dumbarton.

265. MODEL of a Cingalese outrigger canoe.

Lent by Mr. Thos. F. Dodd.

266. MODEL of the Trinity House steam yacht "GALATEA," tons 507 B.M., nominal horse power 200. Makers of the engines, Messrs. Laird and Co. Launched in 1867. Built by Messrs. Caird and Company, Greenock.

Lent by the Corporation of the Trinity House.

267. Set of telescopes formerly belonging to, and used by, Admiral Lord Nelson.

Lent by Mr. W. H. Maitland.

The set consists of, one 4 ft. glass; one day and night glass; one hand glass; two spare tubes, and an eye piece.

268. Half block MODEL of a Whitby five-man fishing boat. Length, 57 ft.; breadth, 17 ft.; depth, 8 ft. 4 in. Registered tonnage, 45 tons.

Lent by Mr. T. Turnbull, A.I.N.A.

269. Half block MODEL of a "COBLE" of the Yorkshire coast. Each five-man fishing boat carries two cobles. The flat after end allows them to be easily beached. When under sail a rudder projecting 4 ft. below the stern is used.

Lent by Mr. T. Turnbull, A.I.N.A.

270. Whole MODEL of the City of Dublin Steam Packet Company's Mail Steamer "CONNAUGHT," running between Kingstown and Holyhead. Length, 348 ft.; width, 35 ft.; depth, 20 ft. 3 in.; tonnage, 2,039; nominal horse-power, 720; diameter of cylinders, 98 inches; length of stroke, 6 ft. 6 in.; speed, 21 statute miles per hour. Makers of the engines, which are on the oscillating principle, Messrs. Ravenhill, Salkeld, and Co., London. The ship was designed and built by Messrs. John Laird, Sons, and Co., Birkenhead, and launched in 1860.

Lent by Messrs. Laird Brothers, Birkenhead.

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